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As the Editor Views the News

JUDGE NIELDS' decision in the Weirton case is a solid blow to the hopes of the labor bloc. Two years ago, Senator Wagner, William Green and others visualized a golden opportunity to enhance the power and prestige of A. F. of L. Taking advantage of the sympathetic attitude of the President and the gullibility of many of his advisers, they loaded much of the administration recovery legislation with clauses favorable to A. F. of L. In the hysteria of the period, they succeeded in forcing the enactment of many unfair and vicious labor provisions. They did their utmost to make industrial employes bow to the will of a small minority.

• • •

Winning a Good Fight

That they fell far short of their objective is due to several factors. Their tactics became so raw that General Johnson, Secretary Perkins and Donald Richberg could not sanction them. Even the President had to interfere on several occasions, notably in the automobile case. A second factor was that more than 90 per cent of industrial employes have no desire to belong to professional unions. A third factor was the vigorous fight waged by employers to prevent their employes from being victimized by professional labor union leaders and racketeers. That fight, of which the Weirton case was an important part, now has been rewarded by victory (p. 22) in the Wilmington court.

• • •

Should Stiffen Backbones

Appeals from the Nields' rulings probably cannot be passed upon by the Supreme Court before fall. Meanwhile the present term of NIRA will expire. In the face of the decision that Section 7a is unconstitutional when applied to a company like Weirton Steel and that an employe representation plan affords a proper means of bargaining collectively, congress will examine Wagner's labor disputes bill, the Black 30-hour bill and the forthcoming bill for extending NRA more critically. Certainly the Wilmington ruling, considered in conjunction with other recent decisions against new deal measures (p. 29), should stiffen the backbones of legislators who heretofore have been too ready to lie down and roll over at the command of A. F. of L. Likewise it should spur every industrial executive to renewed vigor in fighting obnoxious, discriminatory legislation of all kinds.

• • •

Wanted: Sales Engineering

Years ago "sales engineering" was a popular term in industry. Considering the need for it now, it is surprising that one hears so little about it in current discussion. Certainly there never was a time when straight selling required more assistance from engineers, metallurgists and other specialists. For example, consider the problem of introducing stainless irons and steels into the industrial piping market. The principal obstacle is the problem of fabrication (p. 38), and until the designers and other technicians can smooth out some of the existing difficulties, salesmen will be handicapped in this promising market. "Sales engineering" may not be the proper term, but something akin to it is needed to designate the alliance of selling and technical service necessary for tapping today's markets.

• • •

Materials "Tailor-Made"

The most intelligent merchandising now being done in the iron, steel and metalworking industries is that which is based on the principle of supplying the best material or product to meet the requirements of a specific job. "The right material in the right place" is an apt slogan. Anyone who reads the list of numerous varieties of irons, steels, alloys and nonferrous metals specified for oil refinery pumps (p. 64), will realize at once the extent to which the application of materials to industrial needs is becoming a "tailor-made" proposition. . . . By the same token, the problems of fabrication are becoming more complex. Welding of the less frequently used alloy steels (p. 42) calls for highly specialized procedure. Verily, this is a day of individualistic treatment.

E. L. Shaw

Court Voids 7a for Steel Works; Upholds Employe Plan

A DOUBLE barrier to federal intervention in the relations of iron and steel producers with their employes was erected last Wednesday by Judge John P. Nields in the federal district court at Wilmington, Del. In a ruling in the case brought by the department of justice against the Weirton Steel Co., growing out of the employe representative election at Weirton Dec. 15, 1933, the court held:

First, section 7a, the collective bargaining clause, of the national industrial recovery act is unconstitutional and void as applied to the Weirton company because the actual process of manufacturing iron and steel is intrastate and hence beyond the scope of the commerce clause of the constitution.

Second, as a matter of fact, the employe representation plan of the Weirton company is a lawful organization of employes and complies with the intent of 7a, even though that section is not legally applicable to the Weirton company.

For the iron and steel industry the decision by Judge Nields is a sweeping victory. For that matter, it reaches out to a vast majority of manufacturing enterprises, which can be defined as strictly intrastate, and is the most serious legal defeat yet encountered by the new deal. Certainly it knocks out from under NRA its chief prop.

Typical of the attitude of new dealers in Washington is the comment of Blackwell Smith, acting chief counsel of NRA, that the decision is based upon an "outmoded" interpretation of the constitution. In other words, the constitution and its checks and balances are regarded by the new deal as antiquated and not to be countenanced as when in conflict with new deal theories.

Lay Plans for Appeal

Immediately the decision was announced at Wilmington, Attorney General Cummings stated in Washington that an appeal will be taken. No matter which side wins in the intervening courts, a final decision by the United States Supreme Court appears assured. There is an undercurrent among new dealers that the 5 to 4 division of the Supreme Court in favor of new deal policies generally will prevail.

Obviously, the opinion of Judge Nields is directly applicable only to the Weirton company. But other iron and steel producers with a similar setup and with a bonafide employe representation plan stand in the same relation to NRA and hence presumably will be blanketed by the decision.

In reaching his conclusion, Judge Nields rested on the time-honored and court-validated viewpoint that the actual manufacture of iron and steel is purely an intrastate matter. The assemblage of iron ore, coal, coke, limestone and other raw materials is interstate when state lines are crossed.

But these raw materials come to rest, as it were, just prior to the actual process of manufacture and hence mill processes are intrastate, and the relation of mill employes to management is not subject to federal supervision or control.

Ernest T. Weir

Federal Judge Nields, at Wilmington, gave the chairman of the National Steel Corp., leaving for a vacation in Bermuda, the best possible sendoff when he announced his decision that section 7a of the recovery act is not applicable to the Weirton subsidiary of National, just as Mr. Weir was sailing. Wide World photo

Beyond the actual process of manufacture much the same legal assumption obtains. Iron and steel are sold f.o.b. furnace or mill, as the steel code prescribes that quotations shall be the sum of the base plus freight, and the presumption is that the buyer takes possession of the material immediately it is loaded on freight cars or trucks at the point of production.

Probably every iron and steel plant in the country can thus qualify as an intrastate venture, but whether every employe representation plan can conjure up as clean a bill of health as Weirton's has is a matter of individual showing.

In Washington there is much speculation as to the effect of the Nields decision upon current labor legislation. The Wagner bill, introduced two weeks ago in the senate, is designed to strengthen section 7a as well as to outlaw so-called company unions and to implement the national labor relations board and allied boards, such as created for steel. Also close to labor's heart are the 30-hour work-week bills.

Denied the impetus to unionize supplied by section 7a—an impetus that has proved chimerical—Washington wonders whether organized labor will strike out and become more aggressive.

The immediate reaction is that the crest of organized labor's opportunity is past and that no really serious damage or handicap to recovery can be interposed.

Clear-Cut, Forceful Decision

The opinion of Judge Nields is considered remarkable for its clarity and force. Strictly speaking, the key issue was the constitutionality of section 7a as applied to a company like Weirton; Judge Nields went even further and buttressed his ruling by a clear-cut and emphatic review of the operation of the Weirton employe representation plan, which was based upon the longtime setup of the Bethlehem Steel Co. No court decision in recent times has so effectively torn the mask off labor's pretensions.

"The enactment of section 7a either is authorized by the commerce clause of the constitution or it is unauthorized and void," said Judge Nields. "The manufacturing operations conducted by the defendant in its various plants or mills do not constitute interstate commerce".

Further, Judge Nields declared:

"The relations between the defendant and its employes do not affect interstate commerce. Manufacturing is a co-operative enterprise.

Production in quantities and quality, with consequent wages, salaries and dividends depends upon a sympathetic co-operation of management and workmen. A relation acceptable and satisfactory to both workmen and management is an essential feature of the enterprise. If satisfactory, the court will not disturb it."

Reviewing employe relations at Weirton, Judge Nields observed: "During the summer of 1933, the committee of 49 workers, comprising the company union, functioned effectively and adjusted many grievances. Harmonious relations prevailed. But within a fortnight seeds of discord were planted and organized labor took notice of the Weirton situation."

Membership among Weirton employes was obtained by the Amalgamated association of Iron, Steel and Tin Workers, "in the main by misrepresentation and extravagant promises. There was no warrant for branding as a slacker a man who refused to join a labor organization. Misrepresentation, threats of closed shops and increase in initiation fees is thoroughly borne out by a great preponderance of the evidence."

Sanctions Company Payments

Concerning the company's payment of $25 a month to employe representatives, Judge Nields commented:

"There can be no objection to the manner of compensation. This fee of $25 appears entirely reasonable. In practically every instance it is less than the regular wages of the representative for a like period of time spent at his regular work. Fifty-seven witnesses testified it was less than fair compensation for the time and work spent. There is no evidence that anybody was influenced thereby.

"It should always be borne in mind that each divisional committee (of the company union) has the power of recalling its representatives and that any one false to his trust would fail of re-election."

For printing forms, ballots and posters of the employe plan the company donated $6000, which was regarded as intimidation by the government.

"Paying money to a committee of men," Judge Nields said, "instead of requiring each particular disbursement to be submitted to the company for approval contributes to the independence of the representatives. The total expense of the representative plan is about $27,000 a year. The yearly payroll of the defendant averages $15,000,000. It is not unreasonable to apply less than ¼ of 1 per cent of the pay roll to preserve harmony between the management and men when it affirmatively appears that no evil results therefrom."

Summing up, Judge Nields held: "By a clear preponderance of evidence, this court finds that the plan of employe representation in effect among the employes of the defendant affords a lawful and effective organization of the employes for collective bargaining through representatives of their own choosing; that in all respects it complies with the provisions of section 7-a of the national industrial recovery act and section 1, article 4, of the steel code; that in all respects it is directly operated and controlled by the defendant's employes and is not dominated or controlled by defendant or its agents; that in all respects it is satisfactory to the great majority of the defendant's employes."

Also, in his decision Judge Nields holds as "fantastic" the contention of the government that recurrent hard times should suspend constitutional limitations, and he hit the old world theory that industry and labor required a system of checks and balances.

"The American theory of that relation is dependent upon mutual interest, understanding and good will, and this theory is embodied in the Weirton plan of employe organization."

Will Not Abandon Plans

While the Nields decision apparently withdraws from the steel industry, as indeed all others that are strictly intrastate, the necessity for collective bargaining, it is certain that employe representation plans will be continued. They offer the steel industry the opportunity to do a job on industrial relations such as has been done in regard to safety. Indeed, as in the case of the United States Steel Corp., the plan cannot be terminated without a majority vote of employes.

James A. Emery, counsel for the National Association of Manufacturers, comments as follows on the decision:

"This decision will promote rational employment relations. It conclusively refutes the misrepresentations of those who claimed the Weirton employes did not freely establish

Steel Corp. To Substitute Insurance for Stock

STOCKHOLDERS of the United States Steel Corp. are being asked to vote on the adoption of an employe group life insurance plan, the cost to be borne jointly by the management and the employes.

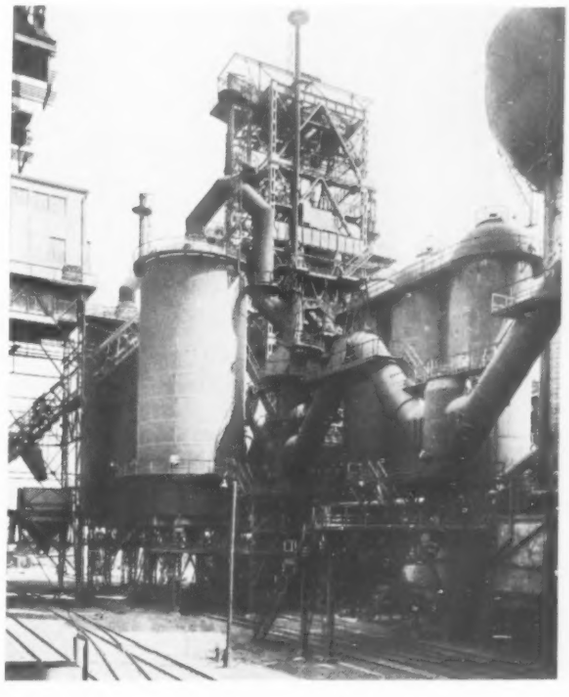
The plan, it is said, is similar to that now employed by a number of other large industrial organizations. It has the endorsement of the Steel corporation directors.

At the same time, stockholders are being asked to vote on abrogation of the Corporation's profit sharing and stock subscription plans. There has been no distribution under the former plan since 1930, and no offering of stock to employes since 1933.

The proposed life insurance plan, it is understood, will have no bearing on the Corporation's existing welfare and pension program.

In Germany

How differently Germans construct their blast furnaces is depicted in the accompanying photo of a new stack of Frederick Krupp Inc. in Essen-Borbeck on the Rhein-Herne canal. Note the intricate structural steel work above the stack. Hot blast is supplied by three stoves. Gas from the furnace is led into a primary and secondary dust catcher, thence into a series of separators connected by inverted V-shaped mains, and finally into a fine cleaning plant before being burned in the stoves and boilers



without interference their own plan of collective relations. It makes equally clear in accordance with a century of decisions that congress cannot regulate manufacturing under the guise of regulating commerce.

"It sounds the death knell of the fundamental fallacies underlying the pending 30-hour week bill, the Guffey coal bill, and the Wagner labor disputes bill. It revives constitutional government."

"Complete Vindication"—Weir

Informed of the decision just as he was sailing for Bermuda, Ernest T. Weir, chairman of the National Steel Corp., of which Weirton Steel Co. is a subsidiary, said:

"Naturally, I am greatly pleased over the favorable and very sweeping decision of Judge Nields. It is a complete vindication of our constant position that we have never, in any way, influenced or dominated our employes in the operation of their employe representation plan and that at all times they have had complete freedom of action and have conducted their organization according to their own ideas.

"It also decides the legality of the employe representation plan and its outstanding value to employes in the matter of collective bargaining with their employers."

President Roosevelt said Friday he might comment this week on the Weirton decision.

NRA

DIVISIONAL Administrator Ellis said Friday the zinc code will be submitted to the national industrial recovery board in a few days. NRA offcials last week also:

Received application of the standard steel barrel and drum manufacturing industry to amend its code to provide for mandatory observance of price filing provisions.

Received budget of metal tank industry totaling $17,925 to cover code administration expense from Jan. 1 to June 16.

Granted a stay to Feb. 16 in the hours provision of the lead industry's code to permit a maximum working period of 16 hours in 24 to meet the occasional requirements of changing shifts.

Received application of the job galvanizing metal coating industry for a budget of $10,280 for the period Nov. 28, 1934, to June 16, 1935.

Transportation

UNION Pacific's six-car aluminum train, which recently set a cross-continent record, is in the Pullman shops at Chicago for the addition of a dining car. The two aluminum nine-car trains now under construction there are expected to be placed in service on May 1.

Centenary of Use of Coke

ONE hundred years ago—in 1835—*the infant blast furnace industry in the United States had just begun to turn from charcoal fuel to the use of coke. William Firmstone in* 1835 *at his Mary Anne furnace, Huntingdon county, Pennsylvania, was the first to try coke for some extended period.*

"Some good gray iron was made with it," says Butler's Fifty Years of Iron and Steel. "Why he did not continue has never been recorded," concludes this authority in noting that Mr. Firmstone dropped the use of coke in his blast furnace after a short time.

By 1856, *however, the trend was well established, for by that time,* 21 *blast furnaces in Pennsylvania and three in Maryland were using coke.*

Merger

ANSWERING the department of justice suit to block the proposed merger of the Republic Steel Corp. and the Corrigan, McKinney Steel Co., counsel for the steel companies contended in the federal district court at Cleveland last week that the merger "rests on sound, practical business considerations."

While the merger if consummated will eliminate such competition between Republic and Corrigan as now exists, it will not substantially lessen competition or tend to restrict commerce or create a monopoly within the meaning of section 7 of the Clayton act, the reply, filed Wednesday, argues.

Aim for Better Balance

Republic's ingot capacity is claimed to be only 7.2 per cent of the total of the industry, and Corrigan's 1.5. Practical business considerations underlying the proposed merger are that Corrigan has capacity for pig iron and semifinished steel in excess of finished steel, whereas Republic normally has an excess of finishing capacity. Combined, there would be a better balance of semifinished and finished steel capacities and better integration from iron ore to finished steel, according to the reply.

Competition in pig iron between the two companies is claimed to be negligible for the reason Republic sells iron only from its Alabama and Buffalo plants, which are markets not served by Corrigan.

In 1933, out of 1,465,300 tons of semifinished steel produced by Republic, only 105,933 tons was for the market of which 29,137 tons was alloy steel of a kind not manufactured by Corrigan. Possible competitive tons of semifinished steel made by Republic in 1933 thus was limited to 76,796.

In a letter to stockholders last week, Republic notified them that it will vigorously contest the suit, that its counsel had given assurance of the legality of the merger, and that the company still is of the same opinion.

By stipulation, the case will be tried on its merits beginning March 18.

At the annual meeting of the McKinney Steel Holding Co. last week, Oscar Cox, liquidator for the Union Trust Cleveland, declared that the merger would benefit the company both as to liquidity and income.

Customers of Republic are being asked to make out affidavits tending to substantiate the competitive character of its business.

Institute

AMENDMENTS to regulations No. 9 of the steel code authority have done little to appease the objections of many independent fabricators, who now, in fact, appear more vigorous in their opposition than before.

The amendments, which became effective March 1, have met certain objections, but, at the same time, have so strengthened certain other features objectionable to fabricators that some of these latter at least now regard the document as the most drastic in its effect on their industry they have ever seen.

Regulations No. 9 pertain to plates, shapes and bars purchased for fabrication for identified structures and were first made effective Oct. 10. The steel code authority pointed out that railroad freight tariffs provide certain charges for the privilege of stopping plates, shapes and bars in transit for fabrication and reship-

(*Please turn to Page* 96)

Production

EASING 2 points last week to 48 per cent, steelmaking appears to have reached the bottom of the slide and will probably hold at around this level the remainder of this quarter. Of the ten districts figuring in this compilation, five held steady and five registered declines, accounting for the 2-point drop. Details follow:

Youngstown—Dropped 8 points to 50 per cent last week, but is expected to rebound to 52 per cent at this week's start. Forty-seven or 48 open hearths were in operation last week.

Buffalo—Off 5 points to 40 per cent, with no immediate change in sight. This drop is due to the failure of the structural and railroad lines

to show expected improvement. Fifteen open hearths are in production.

Chicago—Held at 53 per cent, and indications point to a maintenance of operations around the present level for a short time ahead. One steelworks blast furnace has been banked, leaving 13 of 36 active. Two merchant stacks also are in blast. Full-time operations at the Elwood, Ind., plant of the American Sheet and Tin Plate Co. were resumed last week and will continue indefinitely. Plant heads were in receipt of orders for increased production from the parent company.

Cleveland-Lorain — Down 5 points to 74 per cent, Corrigan, McKinney Steel Co. taking off two open hearths, operating ten; Otis Steel Co. eight, and National Tube Co., Lorain, 11. A further reduction of 5 points may develop this week, one interest considering taking off two units.

Wheeling — Off 7 points to 78 per cent last week, with 30 out of 37 open-hearth furnaces on schedule in the district's four plants.

Central Eastern Seaboard — Down approximately 1½ points to 29½ per cent. The immediate outlook is for little change, although the trend appears downward at the moment.

Pittsburgh — Unchanged at 37 per cent last week, following three weeks consecutive decline. One steelworks blast furnace has been banked by Jones & Laughlin Steel Corp. at its Eliza works, making 23 out of 56 stacks active.

Also holding unchanged last week were New England at 63 per cent, Birmingham at 55½ and Detroit at 100, with little or no change indicated for this week.

Steelmaking Operations

Percentage of Open-Hearth Ingot Capacity Engaged in 10 Leading Districts

	Week ended Mar. 2	Change	Same week 1934	Same week 1933
Pittsburgh	37	None	31	15
Chicago	53	None	44	16
Eastern Pa.	29½	— 1½	30	10
Youngstown	50	— 8	52	16
Wheeling	78	— 7	77	†
Cleveland	74	— 5	79	21
Buffalo	40	— 5	52	23
Birmingham	55½	None	52	15
New England	63	None	65	†
Detroit	100	None	79	†
	48	— 2	48	15

†Not reported in 1933.

CANADA MAKES MORE IRON

January production of pig iron in Canada was 42,634 tons, against 30,677 tons in December. January output breaks down to 28,697 tons of basic, 13,761 tons of foundry and 1958 tons of malleable.

Inland, J & L, Soviet Order New Mills

ALREADY groggy from the plan of the United States Steel Corp. to spend $47,000,000 and of the Bethlehem Steel Corp for $20,000,000, obsolescence took another pounding from the steel industry last week when the Jones & Laughlin Steel Corp., Pittsburgh, and the Inland Steel Co., Chicago, placed noteworthy equipment orders.

Supplementing this was the action of the United Engineering & Foundry Co., Pittsburgh, in booking from the Amtorg Trading Corp., New York, a complete roller-bearing equipped electrically-driven rolling mill to be erected at the Zaporojstal steelworks in Soviet Russia. Involving more than $3,000,000, the order is the largest one for steel rolling mill equipment ever placed in the United States for export.

To the Mackintosh-Hemphill Co., Pittsburgh, went the order of Inland for a complete rebuilding of a two-high, one-stand 36-inch blooming mill at its Indiana Harbor, Ind., works. New tables and manipulators will be installed, as well as new auxiliaries, and on completion the mill will be enlarged either to 40 or 44 inches. The contract totals about $500,000.

Also to Mackintosh-Hemphill Jones & Laughlin awarded a complete 44-inch two-high reversing electrically-driven blooming mill for installation at its South Side works in Pittsburgh, plus manipulators, shears and tables. Except for an installation by Ford, this is the first blooming mill to be built in this country since 1928.

Auxiliaries Also Ordered

General Electric Co., Schnectady, N. Y., has been awarded the contract for the electrical equipment. Morgan Engineering Co., Alliance, O., will supply three soaking pit cranes each having a span of 92 feet 6 inches seven motors, and a capacity of 15 tons.

Cleveland Crane & Engineering Co., Cleveland, has booked the mill cranes for the Jones & Laughlin improvement, including one 60-ton crane with an 87-foot span and four motors; a 5-ton special 76-foot span, four motors, having a special revolving trolley; and a 40-ton three-motor trolley. These cranes are all-welded construction.

Part of the mill booked by United for Amtorg, which will be similar in design to one now being completed for the Ford Motor Co., Detroit, will be built in the soviet, according to detailed drawings and technical assistance to be furnished by the United company. Completion is expected in 15 months. The Zaporojstal steelworks is designed to have a capacity of 600,000 metric tons annually of hot and cold rolled strip steel up to 60-inch widths.

Last week at Pittsburgh, when the agreement was executed by I. V. Boyeff, chairman of Amtorg Trading Corp., and V. K. Bogdan, first vice president of the company, on the one hand, and George T. Ladd and K. C. Gardner, president and vice president of the United company, on the other, it marked the first important Russian business of this nature closed in this country.

The contract was also countersigned by I. Z. Rogachevsky, president and general manager of the Zaporojstal steelworks.

Mr. Ladd was host at a dinner at the Duquesne club, Pittsburgh, Feb. 25, to the above named Russian representatives and in addition: N. I. Naryshkin, A. K. Poudikov, R. I. Shestopalov and I. N. Ostashkevich, all metallurgical engineers of the Zaporojstal works.

As part of the $47,000,000 which the Steel corporation plans to expend for new equipment, it is understood that capacity will be installed by the National Tube Co. in the Pittsburgh district for making large size seamless tubing, the semifinished steel to be supplied by the Homestead works of the Carnegie Steel Co.

Will Cost 18 Billions To Overcome Obsolescence

CONCLUDING a nation-wide survey on potential machinery requirements of American industrial plants, the Machinery and Allied Products institute, Washington, reports these findings:

> Pentup demand for machinery accumulated during the depression totals $18,574,000,000.
>
> To satisfy this demand would require 20,123,000,000 man hours of labor costing $12,073,600,000 in payrolls; in other words, two years work for 4,000,000 men, or more than four times the present number employed in the machinery industries.

Census figures indicate that annual production of machinery in the pre-depression years was $6,609,500,000, while during the depression it has been only $2,737,500,000, or a depression shortage of $3,872,000,000 a year. This makes no allowance for price changes during the period.

The survey also disclosed that the great bulk of the machinery and equipment used to produce more than $70,000,000,000 worth of goods in 1929 is still in place.

7 More Stacks In, February Pig Iron Up 20.9 Per Cent

A NET increase of 7 more active blast furnaces in February complementing the 22 stacks which had resumed in January made it possible for February production of coke pig iron in the United States to register another substantial gain, thereby continuing the rising trend to five consecutive months. On the last day of the month, 96 blast furnaces were in operation.

Average daily production of pig iron in February was 57,686 gross tons, an increase of 9994 tons, or 20.9 per cent, over the 47,692-ton daily output of January. This was the best February since 1931 with 61,114 tons per day; the rate for February, one year ago, was 45,385 tons a day. It was also the highest daily rate for any month since last June with 64,563 tons.

Total production in February was 1,615,207 tons, a gain of 136,764 tons, or 9.25 per cent, over the 1,478,443 tons of the preceding month, and this in view of the fact that February was a 3-day shorter month than January. This total output was the best for any month since last June with 1,936,897 tons, and the best February for any year since 1931 with 1,711,192 tons. In February, 1934, total production was 1,270,792 tons.

In two months of 1935, production has aggregated 3,093,650 tons, which compared with the 2,496,435 tons made in the first two months of 1934, was a gain of 597,215 tons, or 23.9 per cent.

Relating production to capacity, operations in February were at the rate of 41.4 per cent, as compared with 34.2 per cent in January, and 23.7 per cent in December.

The 96 operating blast furnaces on the last day of February was a net gain of 7 over the 89 making iron on Jan. 31. This was the highest number in blast for any month since last May with 117 and the highest for any February since February, 1931, with 109.

During the month, 11 furnaces resumed operations and 4 were blown out or banked. Of the steelworks or nonmerchant class, 9 became active and 4 were taken out, the net gain being 5 units. Of the merchant class, 2 were blown in and none blown out.

Furnaces resuming operation during February were: In Ohio: Hubbard No. 1, Youngstown Sheet & Tube Co. In Pennsylvania: Bethlehem G and Cambria E, Bethlehem Steel Co.; Carrie No. 3, Carnegie Steel Co. In Virginia: Reusens, Lavino Furnace Co. In Alabama: Ensley Nos. 2, 5 and 6, and Fairfield No. 6, Tennessee Coal, Iron & Railroad Co. In Illinois: One South Chicago, Wisconsin Steel Co. In Indiana: Gary No. 1, Illinois Steel Co.

Furnaces blown out or banked during the month were: In Ohio: Haselton No. 2, Republic Steel Corp. In Pennsylvania: Farrel No. 2, Carnegie Steel Co.; one Eliza, Jones & Laughlin Steel Corp. In Indiana: Gary No. 2, Illinois Steel Co.

AVERAGE DAILY PRODUCTION

Gross Tons

	1935	1934	1933	1932
Jan.	47,692	39,537	18,348	31,336
Feb.	57,686	45,385	19,752	33,122
Feb.		45,385	19,752	33,122
Mar.		52,438	17,484	31,194
Apr.		57,873	20,786	28,524
May		66,370	28,784	25,282
June		64,563	42,165	20,867
July		39,630	58,108	18,394
Aug.		34,199	59,137	17,035
Sept.		29,969	50,264	19,788
Oct.		30,689	43,824	20,795
Nov.		31,930	36,124	20,858
Dec.		33,161	38,456	17,650
Ave.	52,433	43,774	36,223	23,699

FEBRUARY IRON PRODUCTION

	No. in blast last day of Feb.	No. in blast last day of Jan.	Total tonnage Merchant	Total tonnage Nonmerchant
Ohio	27	27	55,886	419,494
Penna.	28	27	16,814*	419,262*
Alabama	8	4	36,292*	57,904
Illinois	8	7	29,500	117,418
New York	5	5	30,655	71,481
Colorado	1	1	2,552	234,118
Indiana	7	7		
Maryland	3	3		
Virginia	1	0		
Kentucky	1	1	7,188	116,643
Mass.	0	0		
Tennessee	0	0		
Utah	1	1		
West Va.	3	3		
Michigan	3	3		
Minnesota	0	0		
Missouri	0	0		
Total	96	89	178,887*	1,436,320*

*Includes ferro and spiegeleisen.

MONTHLY IRON PRODUCTION

Gross Tons

	1935	1934	1933
Jan.	1,478,443	1,225,643	568,785
Feb.	1,615,207	1,270,792	553,067
Tot. 2 mo.	3,093,650	2,496,435	1,121,852
Mar.		1,625,588	542,013
Apr.		1,736,217	623,606
May		2,057,471	892,326
June		1,936,897	1,264,953
July		1,228,544	1,801,345
Aug.		1,060,187	1,833,265
Sept.		899,075	1,507,931
Oct.		951,353	1,358,540
Nov.		957,906	1,083,740
Dec.		1,028,006	1,192,136
Total		15,977,679	13,221,707

	Basic O. H.	Acid O. H.	Bessemer	Electric	Crucible	Total
Dec. 31, 1934	60,010,097	944,620	7,895,000	869,364	15,620	69,734,701
Dec. 31, 1933	59,622,517	961,296	7,895,000	895,112	16,700	69,390,625

RATE OF OPERATION

(Relation of Production to Capacity)

	1935[1]	1934[2]	1933[3]	1932[4]
Jan.	34.2	28.3	13.3	22.1
Feb.	41.4	32.5	14.3	23.4
Mar.		37.5	12.7	22.0
Apr.		41.4	15.1	20.2
May		47.5	20.9	17.9
June		46.3	30.6	14.7
July		28.4	42.4	13.0
Aug.		24.5	42.8	12.0
Sept.		21.5	36.4	14.0
Oct.		22.1	31.8	14.7
Nov.		22.8	26.2	14.7
Dec.		23.7	27.9	12.5

[1]Based on capacity of 50,845,741 gross tons, Dec. 31, 1934; [2]capacity of 50,975,561 tons, Dec. 31, 1933; [3]capacity of 50,313,975 tons, Dec. 31, 1932; [4]capacity of 51,598,175 tons, Dec. 31, 1931. Capacities by American Iron and Steel Institute.

New Capacity

ANNUAL capacity for making steel ingots in the United States was 69,734,701 gross tons as of Dec. 31, 1934, according to the American Iron and Steel Institute.

No new open-hearth or bessemer capacity was created last year, but there is a slight increase over the 1933 figure for the reason an understatement was made by an open-hearth interest for 1933.

Following is a comparison of ingot capacity of various types:

Blast furnace capacity for producing pig iron was 50,134,241 gross tons annually as of Dec. 31, 1934, a decline from the annual capacity of 50,321,661 gross tons reported for 1933, due to the abandonment of some furnaces. Annual capacity for producing ferroalloys was 846,000 gross tons for 1934, as against 788,400 gross tons in 1933. Comparisons for pig iron are:

	Pig Iron	Ferroalloys	Total
Dec. 31, 1934	50,134,241	846,000	50,980,241
Dec. 31, 1933	50,321,661	788,400	51,110,061

Balancing Historical Concept, Technical Fact in Early Iron

By Harry Craig Richardson

THIS is the third and concluding article abstracted from Mr. Richardson's article, "Iron, Prehistoric and Ancient," published in The American Journal of Archaeology, Vol. XXXVIII, No. 4, October-December, 1934. The editors' permission to reprint is hereby acknowledged. Previous articles in this series appeared in STEEL *for Feb. 18 and 25. Mr. Richardson is associated with the Republic Steel Corp., Cleveland*

IT CAN no longer be doubted that primitive man used meteoric iron. And that its use was continued until historical times is amply attested by the earliest objects, some of which are known now to have been made from the celestial metal. This by no means implies utilization, or even the presence, of any considerable quantity.

Less than 300 tons the world over is known to science today, most of which has been found on the American continent. Unaccounted for yet by natural law, this preponderance in the west is frequently cited as proof that primitive races in Europe and Asia must have utilized equal, perhaps larger, amounts. Such speculation is apt to ignore that its premise also connotes meteoric iron as scarce in those areas. The probabilities are that it not only was rare but that its bulk was untouched in primitive times. Only detachable protuberances from some of the larger siderite masses and small, but complete, individuals could be cold-worked. Seldom, indeed, would a malleable fragment be found large enough to shape into weapon or implement; hence utilization, as the evidence shows, must have been chiefly confined to such objects as amulets, beads, rings and images. Telluric (native) iron is even less likely to have been a contributing factor.

Copper Furnaces Not Suitable

Native copper presented a less complex problem. The first copper smelting furnaces were unquestionably shallow holes or trenches, perhaps 2 feet wide and deep, lined with refractory clay. Hand fanning or blow-pipes would be employed to raise the temperature. It is entirely reasonable to assume that attempts to melt iron would be made in these furnaces. Such attempts were, however, foredoomed to failure for the simple reason that even if the temperature could be raised to 2768 degrees Fahr., it could not be maintained at that point long enough to melt the iron.

In other words, these units were far too small to develop heat in the required volume. Something akin to the semi-fused product of a later antiquity might be achieved, but pound for pound as compared with copper the yield in iron would be less than one-fourth and the fuel consumed at least twice as much. Except in some cases of rare necessity this was probably more than the "traffic" would bear.

Nonferrous Material Adequate

Such are conceivable aspects in the primitive background when the working of metal first comes within the vision of history in Sumer, Egypt and Crete. It is not to be wondered that little iron had been used. And with the introduction of crucibles and invention of molds in the third millenium the adequacy of cast copper did not escape those alert civilizations then clustered around the eastern Mediterranean basin.

Here larger objects and a greater variety reflect the steady advance of nonferrous metallurgy in the next thousand years. Skill, grown inventive, is itself recreated in the changing image of its own technique. Then, without a perceptible break, eastern supremacy wanes, and late in the second millenium pre-eminence in metals passes to Central Europe.

Whether the working of metal was indigenous or an intruding culture in Europe may never be known. In Spain and along the coasts the accumulating evidence suggests Oriental influence. But in the Danube valley and on the Rhine a distinctive metallurgy appears, stimulated, no doubt, by the available supplies of good ore and abundance of timber.

Europeans Led Way

In the last analysis it is raw material supply which accounts for the metallurgical ascendancy of Europe, and the appearance there rather than in Asia of huge battle-axes, formidable leaf-shaped swords, and finally the enormous bronze and iron weapons of an eleventh century Hallstatt cemetery. Who these Hallstattians were and whence came their knowledge of iron is not known. One thing is certain; skill such as theirs was never attained in a single century.

Nor is it yet possible to determine

Roman agricultural implements, including hoe, rake and sickle. Note the shank on the sickle, and its resemblance to the modern-day implement which is inserted in a wood handle

precisely the form of furnace employed, for of the many prehistoric iron-works found none can with safety be assigned to this period. It is possible, however, by working backward from types known to have been used by the Kelts to arrive at a reasonably accurate conception.

Melting Chamber Above Ground

Like its copper-smelting prototype, the Hallstatt furnace would be a shallow excavation, about 2 feet square and deep, lined with refractory clay. But where this excavation had formerly comprised the entire unit it was now merely the hearth; the melting chamber proper rose above ground to a height of 2 or 3 feet. Its inner wall, banked with sod, was enclosed by a rough stone facing. Possibly 12 inches square at the top, this chamber gradually widened to twice that dimension at the hearth, into which a free-flowing stream of air was admitted through an opening pointed into the wind.

Furnaces of this type might conceivably produce in eight or ten hours a semifused mass weighing 50 pounds. In this operation alone approximately 200 pounds of charcoal would have been consumed, while subsequent heating and working required at least one-fourth as much more.

Elemental as it appears now, this operation presupposes a technique developed through long experience. Even at best the results were always uncertain. Excess carburization on the one hand, an incomplete reduction on the other, would repeatedly frustrate the unwary or baffle the unskilled. Nor were the difficulties of these early metal-workers at an end with reduction successfully achieved.

The iron mass as it came from the furnace was impregnated with slag, most of which had to be eliminated before the product was forgeable. With crude equipment, tongs, anvils and hammers, this in itself was no inconsiderable problem. Immediately the reduction process had been judged complete, and the furnace had sufficiently cooled, the front wall would be broken down and the slag-iron mass removed.

Many Hours of Hard Work

Some of the cinder and dirt might be loosened by cold-hammering, but the greater proportion, being intimately mixed with the iron, was laboriously squeezed out by repeated heating and hammering. After this, and again with many reheatings, the bloom would be drawn into bars of suitable size and shape to produce the object desired. Starting perhaps with an ore charge of 300 pounds, the successful operator would have produced at the end of his arduous task about 25 pounds of reasonably good iron for forging into weapons or implements.

Such may have been the method employed at Hallstatt, whereby iron-working took rank as a basic industry. And it was this, or a process akin, that the Dorian invasions carried to Greece and which in north Italy reached Villanova (1000 B. C.). Of more enduring significance is the propagation and spread of the process by the conquering Kelts (700-100 B. C.) from whom, in an Etruscanized form, it descended to Rome. And as lip-fires, so-called, Roman type furnaces survived until the end of the eighteenth century A. D., when they gradually gave way to the more economical puddling process invented by Henry Cort.

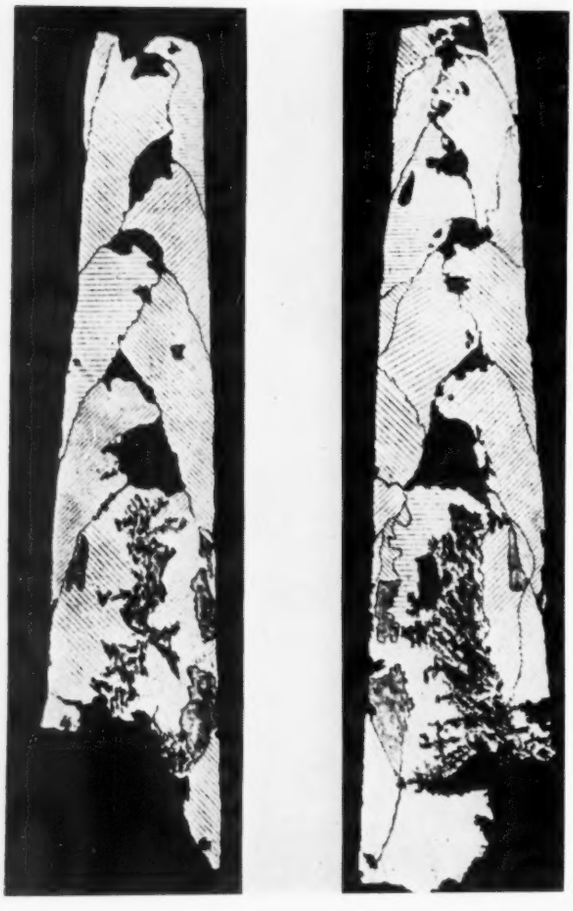
Possibly a Keltic iron-master would have failed to detect the slightest resemblance between his crude furnace and a European lip-fire, but in spite of the improvements of 2000 years iron was still made direct from the ore at temperatures considerably below the melting point. Nothing had been learned of furnace reactions, and the chemistry of the process was as vague to the European of 1700 A. D. as it was incomprehensible to his Keltic predecessor. Of the elements usually in combination with iron neither had knowledge of any except sulphur. Both comprehended, without knowing why, the necessity for oxygen, and, in lesser degree, the resulting effects from the presence of carbon.

Operation of Bellows Perfected

The advance, in a word, was more apparent than real. That the medieval furnace was larger and better controlled is due chiefly to the increased efficiency of the bellows. When or where these first were made applicable is not known, but the probabilities are that the discovery was made south of the Balkans, and no earlier perhaps than the seventh century B. C. Shortly thereafter they appear in the Danube area. Ridgeway, and others, following Quinquerez, have identified pre-Roman furnaces in the Bernese Jura which they claim had been operated with an artificial blast.

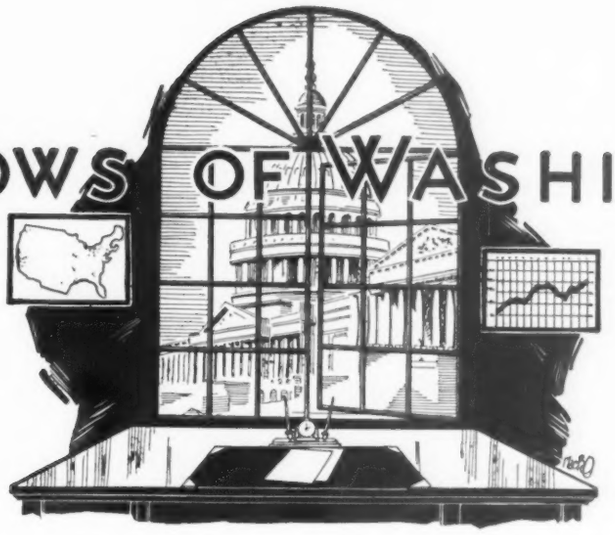
It may be safely assumed that bellows were employed throughout Keltic La Tene (500-1 B. C.), and, after the Etruscan collapse (351 B. C.), by the Romans. As far as the Kelts are concerned, the observable effect is one of accelerated diffusion rather than a step-up in unit production. Roman furnaces, too, are seemingly unchanged until the end of the Second Punic War (201 B. C.), when the mineral resources of Spain were wrested from Carthage. Thenceforth, and impelled no doubt by a widening political horizon, Rome grows "iron-minded." In the last

(Please turn to Page 74)



Drawings showing how the Romans built up their metal blooms

WINDOWS OF WASHINGTON



WASHINGTON

FROM a high-powered juggernaut ruthlessly flattening out all opposition, NRA has been deflated to a point where it is literally riding on the rim. And until the Supreme Court finally passes upon the Weirton Steel and the Kentucky Coal cases its progress apparently will be a dragging, clattering one.

It is a bold front that NRA puts up. Blackwell Smith, acting chief counsel, contends that Judge Nields was motivated by an "outmoded theory of constitutional law" which is typical of the new dealers' regard for precedent.

Donald Richberg, chief co-ordinator for the President, talks about tightening up on the antitrust phase of NRA. The department of justice is considering a program for expediting court action on alleged violations.

The new industrial recovery board, headed by S. Clay Williams, remains on the scene, apparently securely in the saddle, but the fact is most members are chafing and some are anxious to resign, but none cares to until after hearings have been held by congress on the proposed extension of NRA and the proposed investigations have been completed, fearing to quit under fire.

Only those utterly blind to public opinion deny that the Weirton decision and the Kentucky coal case, in which price and wage fixing were held unconstitutional, have virtually given NRA a death blow. What is most damaging is the public's quick impression that NRA is unconstitutional and codes may be violated with impunity.

Meanwhile, on Capitol Hill, the senatorial opposition to NRA, which exists even in Democratic ranks, is emboldened. Now that Senator King, of Utah, is willing to sidetrack the investigation proposed for his judiciary committee, it appears that the finance committee will proceed with the probe demanded by Senators Nye and McCarran. A meeting of the finance committee will be held Tuesday to decide procedure and a date for beginning.

It is by no means impossible, though at the moment it seems rather improbable, that NRA may pass out of the picture June 16 by default. There is an increasing belief that the President, quick to sense that NRA may be a liability in the presidential campaign next year, washed his hands of the matter by his brief and undetailed message to congress. This would leave him free to follow the public whim; he could blame congress either for its continuation or for its natural death at the expiration of the present act.

Incidentally, the senate committee on audit and control has favorably reported out an appropriation of only $5000 for the senate finance committee, which would prohibit the employment of high-priced attorneys to conduct the investigation.

WEIRTON RULING MAY LEAVE LABOR BOARDS HIGH AND DRY

Although created by a separate act, the future of the national labor relations board and also of the collateral boards set up for steel and other industries is in the balance as a result of the Weirton decision.

William Green, president of the American Federation of Labor, declares that "labor cannot accept the decision of Judge Nields as final and conclusive. In the meantime, labor will continue to present cases arising out of disputes over the application of section 7a to the national labor relations board for decision."

The weakness of this position, even admitted in Washington, is that with section 7a knocked out there may be no channel to convey cases to the labor board. The board would be like a house without a door.

Hearings have been concluded on the Black-Connery 30-hour week bill by the subcommittee of the senate judiciary committee. This subcommittee has favorably reported the bill to the full committee, which is expected to report the measure back to senate.

The gossip in Washington is that labor representatives are willing to swap the 30-hour bill for the Wagner labor disputes bill, the real purpose of which is to outlaw so-called company unions.

James A. Emery, chief counsel for the National Association of Manufacturers, coined an apt phrase when he charged last week that the Wagner bill is an attempt to promote "the union dominated company" under the guise of outlawing "the company dominated union."

Mr. Richberg is credited with an effort to sell steel executives the idea of holding elections at all plants in order to disclose just how far the Amalgamated Association of Iron, Steel and Tin Workers comes from controlling the situation.

ADMINISTRATION STILL JITTERY ON ANTITRUST LAWS

It is quite apparent that the President and his various advisers are giving more and more attention to antitrust laws. In this connection, Coordinator Richberg, sometimes called President No. 2, at a gathering at Miami Beach said, "We still need laws to prevent the development of monopolies and those restraints of trade that place barriers across the highways of commerce and enrich the few through the impoverishment of the many.

"But," he continued, "we also need other laws under which trade and industrial associations can be organized and carry out, under public supervision, carefully devised programs for the production and distribution of the largest possible amount of the goods and services so as to provide the greatest possible material comfort and security for the largest number of the American people."

Discussing NRA in this regard Richberg called attention to the fact that "NRA has been given no au-

thority to license monopolies, or to sanction the oppression of small enterprises, or the exaction of unfair prices for consumers. Combinations of producers or distributors for such purposes are just as unlawful today as they have been throughout the decades following the passage of the Sherman law."

GUFFEY COAL BILL WOULD HAMSTRING "CAPTIVE" MINES

Steel has a very lively interest in the Guffey bituminous coal bill providing for establishment of a national bituminous coal commission which would practically allocate quotas and tonnage. No industry operates more "captive" coal mines than iron and steel.

As it now stands, the Guffey bill carries a provision authorizing a definite price to be set on "captive"-mined coal even though it does not enter the market.

Representatives of such large steel companies as United States Steel, Bethlehem, Jones & Laughlin, Republic, Sheet & Tube, Weirton and Wheeling, appeared before a subcommittee of the senate interstate commerce committee Friday to oppose the captive mine feature of the Guffey bill, which they maintained is unconstitutional.

Chances are the bill will not pass.

SEPARATE BASING POINT REPORTS EXPECTED SOON

Amid all the confusion of NRA, the old steel basing point case is rearing its head.

NRA, it will be recalled, withheld transmitting its report to the White House last Dec. 1 when the federal trade commission submitted its report, attempting to work out a joint report with the commission.

Efforts to harmonize the NRA viewpoint, presumably favorable to the present basing point system, and the antagonism of the trade commission to it have failed. Even Co-ordinator Richberg has not been able to use his personal charm effectively on the commission. So now it is probable that both reports will be made public simultaneously, shortly.

The NRA report was sent to the White House Friday by the industrial recovery board.

BIG STEEL OUTLET FOR ARMY BASES, MUNITIONS, PLANES

The steel industry should benefit materially if there should be any fruition to the effort of some of the "big" army men in congress who are now asking that some $400,000,000 be appropriated for modernization of the army. This would be in addition to the $379,000,000 provided for in the appropriation for the army for the coming fiscal year.

One of the projects in mind includes $10,000,000 for a floating drydock at Pearl Harbor, Hawaii. Capacity would also be built for plane construction. Provision would be made for $45,000,000 for reserve ammunition, $35,000,000 for anti-aircraft artillery, $22,000,000 for motorization, $16,000,000 for mechanization, $37,000,000 for modernizing the field artillery, $23,000,000 for coast defenses, $13,000,000 for the Pacific coast and $5,000,000 each for the Canal Zone and Hawaii; for technical construction in the air corps and $80,000,000 for quarters and barracks.

SHOWS 2 BILLIONS SPENT FOR FREIGHT CARS IN 12 YEARS

Joseph B. Eastman, federal co-ordinator of transportation, has sent a letter to all presidents of class 1 railroads, with which he transmitted charts and tables relating to freight car construction cost.

Mr. Eastman states that "during the 12-year period 1922-1933, inclusive, the gross expenditures for freight train cars totaled $1,987,701,000, this amount being 58.1 per cent of the total expenditures on equipment betterments and 25.4 per cent of the grand total additions and betterments charges."

He says further that "the comparison of car costs emphasizes the need for co-ordination and stabilization of car construction, better standardization of equipment and more scientific and equitable basis for car hire payments than is provided in the present per diem rules agreement."

Detailed figures shown in one of the tables, for instance, indicates that for the 12-year period locomotives purchased totaled $856,551,000; freight train cars, $1,987,701,000; passenger train cars, $410,019,000; and other equipment $164,114,000; total expenditure for equipment being $3,418,385,000.

It is further shown in the tables that during the same period $1,188,954,000 was paid for additional track and $394,062,000 for heavier rails, while the grand total for roadway and structure expenditures was $7,804,043,000.

IRON, STEEL DUTIES CHOPPED IN BELGIAN TARIFF PACT

Reduced tariff rates on muck bars, steel ingots, billets and bars, boiler or other iron and steel plate, sheets, beams, girders, joists, angles and hoops are a concession made to Belgium in the first reciprocal trade treaty signed by the United States with any European country.

According to the state department, transportation costs of these products are so high, in comparison with their value, that the areas within which they can be marketed is restricted. Imports of any one item did not reach 1 per cent of domestic production in 1933, is a further extenuation offered.

A comparison of the old and the new duties on certain imports from Belgium follows:

	Old rate	New rate
Muck bars, with exceptions	0.3c	0.25c
Steel ingots, cogged ingots, blooms, and slabs, billets and bars valued at not above 1½c lb.	0.3c	0.25c lb.
Valued above 1½c and not above 2½c lb.	0.5c	0.375c lb.
Billets and bars, valued at not above 1½c lb.	0.3c	0.25c lb.
Valued above 1½c and not above 2½c lb.	0.5c	0.4c lb.
Machined beams, girders, joists, angles, channels, car-truck channels, tees, columns and posts	20%	15% a. v.
Hoop or band iron or steel	0.25c	0.2c lb.

INSTITUTE PROTESTS ANY CUT IN DUTCH IRON DUTY

Extension of the merchant pig iron industry along the eastern seaboard is threatened by low-cost foreign competition, according to the American Iron and Steel institute in a statement to the federal tariff commission, coming just after an announcement of the reduced duties on Belgian steel.

The Institute complains particularly of imports from Belgium, which in ten months of 1934 totaled 59,400 tons and averaged, after duty, $2.77½ per ton less than domestic iron.

From all foreign countries in ten months of 1934 iron imports totaled 105,773 tons delivered at an average of $16.76½, against a quotation of $20.26 for domestic iron delivered at Philadelphia.

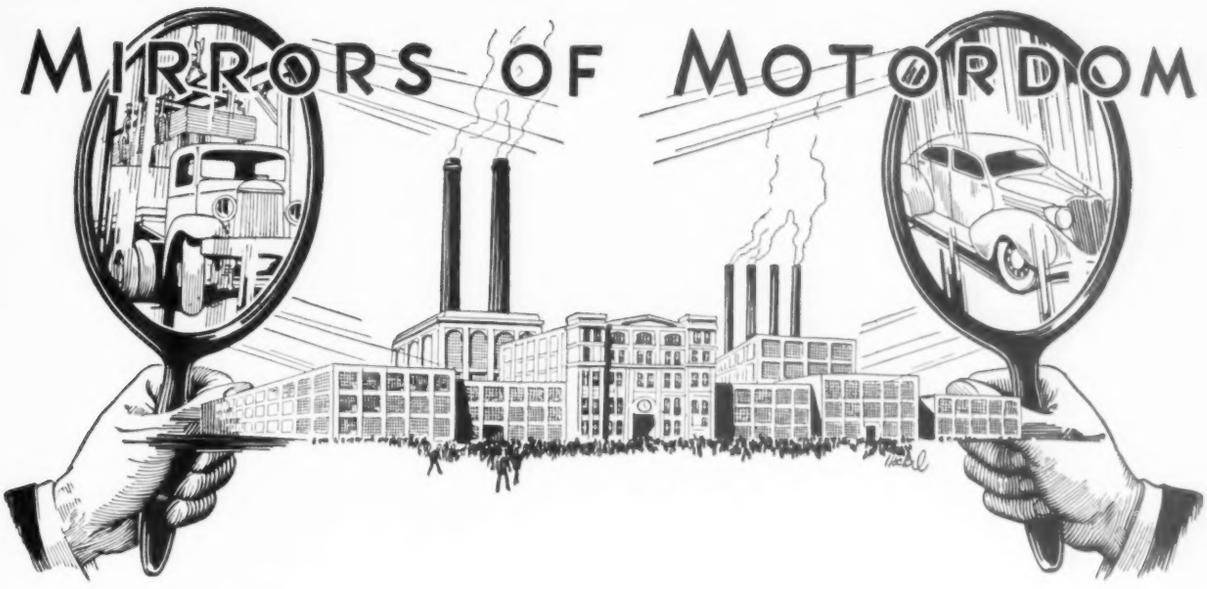
Since 1932, the Institute estimates, American workmen have lost over 3,500,000 hours of labor due to foreign iron importations. Any tariff concessions granted on Dutch iron would also apply to other producing nations under the "most favored nation" clause.

CONFER ON STRUCTURAL CODE

C. G. Conley, president of the Mt. Vernon Bridge Co., Mt. Vernon, O., and head of the American Institute of Steel Construction, and C. Edwin Michael, president of the Virginia Bridge & Iron Co., Roanoke, Va., were in Washington all last week conferring with NRA officials, relative to the structural steel code that has been in dispute since last July. But no definite announcement was made.

More Tin Is Consumed

World consumption of tin in the year ended October, 1934, was 132,900 tons, an increase of 4100 tons over the preceding 12 months, according to the International Tin Research and Development council. At the end of November the world visible stocks of tin totaled 18,598 tons.



DETROIT

IF STEEL production had to break in the first quarter it was a good thing for the mills that it happened at the beginning of February, just prior to the time specified in the steel code for announcing second quarter prices.

In an enthusiastic moment last year the president of one of the larger steel companies observed that the industry would re-enter the profit area when its operations crossed 40 per cent on the way up. He was widely quoted.

Apparently designed to encourage steel stockholders, and not without effect on the stock market, this statement did not escape alert automotive purchasing agents in Detroit. Many clipped it and slipped it under their glass desk tops for future reference.

START HACKING AT PRICES

In January, as the steel rate crossed 40 per cent and then edged up past 50, these purchasing agents started their day by a glance at this clipping. As steel salesmen called they were reminded that their principals must be in the black, and it was suggested that inasmuch as the automotive industry was providing the bulk of the tonnage the time had arrived for granting it a preferential price.

The decline in steel production supplied the answer. It can now be only a matter for speculation, but undoubtedly if the steel rate had galloped upward through February and reached 60 per cent there would have been pressure for a reduction in steel prices for the second quarter. At any rate, it indicates a recovery hazard that is just ahead of the industry.

Introduction of 1935 models also developed a personal hazard for Detroit representatives of suppliers to the automobile industry. A number of manufacturers invited these representatives to pre-showings of the new cars and intimated that it would be pleasant reciprocity if they ordered new cars.

Suppliers who were not represented received a followup letter, in some cases, noting how many cars had been ordered in this manner. A chameleon's life has been a dream of paradise compared with the perplexity of a one or two-car salesman trying to bridge this situation with the dozen or so companies to which he sells.

RESTYLING COSTS HEAVY

This purchasing department yen for lower or preferential prices is more than congenital; it is a direct reflex of the increasing burden that styling is placing upon the automotive industry. Streamlining may be accelerating obsolescence, but at the same time it is accelerating costs.

For a manufacturer to completely redesign his line, necessitating new dies for fenders, bodies and other parts, would cost close to $3,000,000, it is estimated. Assuming an annual production of 100,000, the average is $30 per car. More than one executive has sweated his engineering and manufacturing staffs to chip 30 cents off a car.

To stem the tide of rising costs, automobile executives are exerting pressure in two directions. One is closer buying; the other is more economical design and manufacture.

The latter alternative is easiest for manufacturers of ranges of cars, such as Chrysler and General Motors.

Place a Plymouth and a Dodge alongside, and they are dissimilar largely on account of different treatment of radiator shell, hood and fenders. But in body panels and other stampings the same dies are used to an extent not generally realized.

In Chevrolet, Pontiac and Olds bodies General Motors avails itself of the same advantage accruing from size. The interior trim and appointments may differ, and fender and hood lines be wholly unrelated, but the shells of the bodies have much in common. And body dies are the most expensive items in car manufacture.

This year, by revising its radiator shell and beavertailing its rear end a little, one manufacturer was enabled to change the appearance of the car without buying new fender dies. That item will come next year.

General Motors, incidentally, is in a distinctly transitional stage in both bodies and mechanical parts. Olds and Pontiac have hydraulic brakes; the remainder of the line mechanical ones. The lower half of the line boasts steel "turret" tops; the upper half is not yet so equipped. Chevrolet divides its allegiance on springs between knee action and semi-elliptic.

BUICK SLIPS IN GM RANKS

The outstanding problem of General Motors at this time is Buick. There was a time when Buick was the fair-haired child of the organization, leading in sales, profits and prestige, but no more.

First, Chevrolet passed it. Then two years ago Olds outsold it. Last year Pontiac, which was born as the running mate to the once-forlorn Oakland, joined the procession, leaving Buick out in front of only LaSalle and Cadillac.

The eclipse of Buick, of course, is a by-product of the depression. Not only did buyers of middle class go to the bottom of the price range, but when top price buyers fell they

also didn't stop until they hit bottom.

Buick, which sold 122,656 units in 1930, slipped to 90,873 in 1931, to 49,708 in 1932, to 43,809 in 1933, then rebounded to 63,067 in 1934. By comparison, Chevrolet sales last year totaled 534,906, Pontiac 72,645 and Olds 71,676.

At present, most of Buick's sales are in the 40 series, brought out last year to give it some business below $1000. When the 1936 series is brought out this summer, increasing attention will be paid to the lower brackets. Presumably it will have the steel "turret" top, hydraulic brakes and a complete redesign of weight, including moving the engine forward.

There are some who also fear that Chevrolet is on the way to becoming a problem-child of General Motors. Because it was felt there was overemphasis on this unit, more strength was thrown to other General Motors lines several years ago.

Knudsen, who made Chevrolet what it is today, was made a vice president of the corporation. Klingler was transferred to Pontiac. Without aspersions on their successors, even Chevrolet momentum has suffered from the loss of two such stalwarts. It still is not too late for Chevrolet to catch up with Ford, but each passing day of delay in getting out master models makes the task more difficult.

FORDS BACK AT DESKS

Meanwhile, the tops of the Ford organization are attacking their jobs with the greatest zest of their careers. Henry Ford is not buying schoolhouses or reprinting McGuffey's readers or reviving old time dances, but is spending most of his time in the laboratory at Dearborn.

Edsel Ford has never been so active as in the past few months, and Sorenson, in charge of production, has his office in the plant. Almost a whole floor in the fine new Ford administration building on Coolidge highway in Dearborn is vacant due to the exodus back to the Miller road side of the plant.

Whether or not it is a result of this personal attention, Ford productivity is setting new highs. As noted last week, in actual number of parts made and of machining operations, the present rate exceeds anything in the days of either Model T or Model A.

In addition to consuming 61,000,000 kilowatt hours of electricity every month, it develops that the Ford plant requires 525,000,000 gallons of water daily, more than is used in a day in Detroit, Cincinnati and Washington combined.

The March schedule at Dearborn has been set at 160,000 units, which indicates a daily rate of 6600 a day, on a 6-day week basis. January output was 100,793 units, February 130,000. Last March only 77,947 Fords were built. These figures include trucks.

As noted last week, Plymouth is swelling its line by the addition of two lower-price models—a coupe at $510 and a 2-door sedan at $535—but earlier than was expected. These models incorporate the same engine as in the deluxe Plymouths, all-steel bodies, and other mechanical features of this line. A special high-wheel Plymouth, with 20-inch disk wheels to provide unusual road clearance, is also being announced.

Pontiac, which in February more than doubled its January output of 7390 units, is doing the unusual stunt of bringing its dealers in to the factory in small groups once a month to discuss its plans for advertising. A little nearer to its orders than Olds, Pontiac is picking up some occasional business through inability of persons having Olds on order to wait further for delivery.

Olds, incidentally, in February built more cars than in any month in its history, at 14,000 surpassing the record set in April, 1929. On Feb. 25 it shipped 852 cars which was 143 more than the previous record, on April 26, 1929.

For the industry as a whole, production continues to creep up slightly. Assemblies last week totaled 83,899, compared with 82,481 in the week ended Feb. 23 and 82,119 in the week ended Feb. 16. This indicates a February total of about 325,000.

Automobile executives still cannot take seriously the threat of a strike, despite a vote Friday by 176 locals of the United Automobile Workers union authorizing the American Federation of Labor to call them out. Claimed membership in A. F. of L. unions is 20,000, a scant 5 per cent of the total employment in the industry. Fisher Body has refused demands made upon it at its Cleveland plant, and if there is any trouble, Cleveland will be lucky to emerge with any Fisher Body production.

Automobile Production

Passenger Cars and Trucks
U. S. Only
By Department of Commerce

	1933	1934	1935
Jan.	128,825	156,907	292,765
Feb.	105,447	231,707	325,000*
Mar.	115,272	331,263	.....
Apr.	176,432	354,745	.....
May	214,411	331,652	.....
June	249,727	308,065	.....
July	229,357	266,576	.....
Aug.	232,855	234,810	.....
Sept.	191,800	168,171	.....
Oct.	134,683	132,491	.....
Nov.	60,683	78,465	.....
Dec.	80,656	183,187	.....
Year	1,920,057	2,778,739	.....

*Estimated.

Estimated by *Cram's Reports*

Week ended:	
Feb. 9	78,453
Feb. 16	82,119
Feb. 23	82,481
Mar. 2	83,899

Steel in the News

EUGENE G. GRACE, president, Bethlehem Steel Corp. and its subsidiary, Bethlehem Shipbuilding Corp., Quincy, Mass., said last week in testifying before the senate munitions investigation:

The defense of our country has brought us satisfaction that cannot be disregarded.

I don't think that the desire for profit coming out of the sale of war implements is a factor back of creating war.

War is a problem of relationships between nations, not of munitions manufacturers.

The world's present difficulties are largely traceable to the last war.

War should not be made the vehicle for unconscious profit.

No company could operate under a 100 per cent profits tax.

The government is not and cannot be an efficient manufacturer.

I cannot conceive of the government taking over an institution and telling the man at the head of it to go on and run it.

SKY RIDE TO SCRAP HEAP

The Sky Ride, spectacular feature of Chicago's Century of Progress exposition, will go crashing to the ground next month, according to plans of the wreckers in charge of razing the various fair structures. Each of the two 628-foot towers will be undermined at one side of the base, causing the steel framework to topple to the ground where it will be dismantled. The two towers weigh about 3000 tons. Prior to razing the towers, the ten cars which carried passengers between the two stations will be dropped. Each car weighs 6200 pounds.

Sheet and Tube Subsidiary To Complement New Mill

Youngstown Sheet & Tube Co., Youngstown, O., is organizing a subsidiary—the Youngstown Metal Products Co.—to manufacture sheet metal products. This subsidiary will absorb a part of the flat rolled steel to be produced by the continuous wide sheet-strip mill now in construction at the Campbell works of the company.

Industrial Men in the Day's News

GRISWOLD A. PRICE, who since Jan. 1 has been manager of sales at St. Louis for Carnegie Steel

Griswold A. Price

Co., Illinois Steel Co. and Tennessee Coal, Iron & Railroad Co. (STEEL, Jan. 7, Jan. 25), has been made assistant general manager of sales of the bar, semifinished and alloy steel divisions of Illinois Steel Co., Chicago. He succeeds C. H. Rhodes, who was recently appointed director of purchases for the United States Steel Corp., with offices in New York.

Robert Korsan Jr. succeeds Mr. Price as manager of sales in the St. Louis district for the Illinois, Carnegie and Tennessee companies.

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George F. Elliott has been elected president of the Elliott Co., Jeannette, Pa., succeeding his father, the late W. S. Elliott.

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W. J. McCune, sales department, Sharon Steel Hoop Co., Sharon, Pa., has been appointed salesman for the company in the Cleveland office.

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William Cowles has been appointed eastern manager of sales for the Superior Steel Corp., Pittsburgh, succeeding the late John Wetzel. His headquarters will be in Philadelphia.

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J. H. How, has been named manager of the Sacramento, Calif., office of the Western Machinery Co., succeeding F. M. Lee, who takes up managership of the Salt Lake City, Utah, office.

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R. B. Millar has been appointed assistant to vice president in charge of sales, Bethlehem Steel Co., Bethlehem, Pa., succeeding the late J. H. Kessack. Mr. Millar formerly was in charge of mill schedules. C. S. Goerlich, formerly manager of order entry, has been appointed manager of orders and schedules.

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George H. Bucher, president and general manager of the Westinghouse Electric International Co., New York, has been elected a vice president of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Leo P. Nemzek, for the past several years Chicago sales manager for E. I. du Pont de Nemours & Co., has resigned to become executive general manager of the Compo Shoe Machinery Corp., Boston.

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Franklin Farrel Jr. has been re-elected chairman of the board of Farrel-Birmingham Co. Inc., Ansonia, Conn. Other officers reappointed include: Nelson W. Pickering, president; Carl Hitchcock, Franklin R. Headley and Armin G. Kessler, vice presidents; Frederick M. Drew Jr., treasurer; Laurie K. Blackman, assistant treasurer; George C. Bryant, secretary; and William B. Marvin, assistant secretary.

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William A. Rose has been elected president of the Bassick Co., Bridgeport, Conn., manufacturer of metal furniture, industrial casters and automobile hardware. The company is a subsidiary of the Stewart-Warner Corp., Chicago. Mr. Rose formerly was vice president and general manager of the Bassick Co.

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Charles E. Nesbitt, a member of

E. L. McNamara, Assistant Manager, Roll and Steel Castings Sales, United Engineering & Foundry Co.

A roll salesman for the past seven years, he has become well known in the steel industry of the Valley.

After clerking in a railroad freight office, he was named traffic manager of a Niles, O., steel interest.

Serving in the navy during the war, in 1919 he took up work with a new company, remaining nine years.

E. L. McNAMARA, roll salesman in the Youngstown, O., district since 1928 for the United Engineering & Foundry Co., Pittsburgh, who as noted in STEEL for Feb. 11 was appointed assistant manager of roll and steel casting sales for the company, has had considerable experience in the Mahoning Valley steel industry.

He received his education in the grade schools of Niles, O., and later at the Warren Business college, Warren, O. He began his business career in 1909 as clerk in the freight office of the Pennsylvania railroad at Youngstown, but five years later, in 1914, became traffic manager of the Deforest Sheet & Tin Plate Co., Niles, O.

During the World war, Mr. McNamara was in the navy, later resuming his former position, which he held until 1919, when the Deforest company was absorbed by Republic Iron & Steel Co.

When the Falcon Steel Co., Niles, O., was organized in 1919, he was named purchasing agent and traffic manager. He held this position until 1928, when he went with United Engineering. In his new position, Mr. McNamara will continue his headquarters at Youngstown.

various United States Steel Corp. chemist committees and treasurer of the Pittsburgh unit of the American Chemical society, has been named recipient of the Pittsburgh award for 1934 of the American Chemical society. Among Mr. Nesbitt's past affiliations have been with the Carnegie Steel Co. and National Tube Co.

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W. F. Gradolph has been elected vice president in charge of sales of the DeVilbiss Co., Toledo, O. He has been associated with the company for the past 24 years.

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Sanford B. White has been made secretary of the International Harvester Co., Chicago. Formerly assistant secretary, he succeeds William M. Gale, who continues as assistant treasurer.

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Taylor H. Beech, 1910 Beech street, Wilkinsburg, Pa., has been appointed representative in the Pittsburgh district for the Voris Laboratories, Hagerstown, Md. Among Mr. Beech's previous connections are the Midvale Co. and Carpenter Steel Co.

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Ben Kaplan, M. S. Kaplan & Co., Chicago, has been elected president of the Chicago chapter of the Institute of Scrap Iron and Steel. Other officers elected include: Vice presidents, Arthur Price, Price-Watson Co., Chicago; Morton Teller, Teller Iron Co., Hammond, Ind.; and Max Patinken, Peoples Iron & Metal Co., Chicago, Ill.; treasurer, Walter Erman, Erman-Howell & Co., Chicago; and secretary, Arthur L. Jeffery, Chicago.

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Simpson C. Leonard Jr. has been elected vice president in charge of manufacturing operations and treasurer of the Michigan Leather Packing Co., Detroit. His father, Simpson C. Leonard Sr., is president and one of the original incorporators of the company in 1911. The latter also is permanent secretary of the Western Bar Iron association.

L. Ford Merritt has been elected vice president in charge of sales and production design of the company.

C. S. Ripley, 3110 Payne avenue, Cleveland, has been appointed district sales representative for the company, covering Cleveland, Akron and Youngstown, O., districts.

Albert T. Fisher, 921 Chamber of Commerce building, Cincinnati, has been named representative in the Cincinnati district.

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Charles A. Ferguson, assistant manager of the Farrell, Pa., and Mercer, Pa., works of American Sheet & Tin Plate Co., has been appointed manager of both plants, succeeding William L. Goodhue, of Cleveland, manager for the past three years, who now becomes manager of the Vandergrift, Pa., works.

Died:

ROBERT GOSS WELLS, 59, vice president, Steel Co. of Canada, Hamilton, Ont., in that city, Feb. 22. Born in Utica, N. Y., he was educated in Chicago and in 1894 joined the engineering department of Illinois Steel Co., continuing there for two years. From 1896 to 1899 he was chief draftsman for the Nicopol-Mariopol Mining & Metallurgical Co., Mariopol, Russia. Returning to this country, he was appointed resident engineer for the Dominion Iron & Steel Co., Sydney, N. S., and two years later became engineer of construction for the Otto-Hoffman Coke Co., New York. In 1906 he was appointed superintendent of the Struthers plant of Youngstown Sheet & Tube Co., Youngstown, O.

In 1908 he went abroad again to be general manager of the Tata Iron & Steel Co., Jamshedpur, India, where he remained for five years. He was appointed works manager for the Steel Co. of Canada in 1913, and vice president in 1926. He was a member of the American Iron and Steel Institute.

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James M. Triggs, 64, president, Majestic Furnace Co., Huntington, Ind., recently.

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John L. Herwood, 44, engineer for the Aluminum Co. of America, Pittsburgh, in an automobile accident in Denver, Feb. 25.

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William M. Hefferan, for many years purchasing agent for the South Penn Oil Co. at Steubenville and Marietta, O., in Pittsburgh, Feb. 23.

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Lester F. Thurber, 76, president, White Mountain Freezer Co., and former president of the Co-operative Foundry Co., Nashua, N. H., in that city, Feb. 26.

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Cortland V. Martindale, 27, vice president, Van Camp Hardware & Iron Co., Indianapolis, jobber of hardware and iron and steel products, in Miami, Fla., Feb. 20.

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Claire E. Farnsworth, 60, widely known in the steel and machinery industry of the Pacific coast and founder of the Union Machinery & Supply Co., Seattle, in that city, Feb. 18.

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Martin L. Johnson, 52, for a number of years sales manager of the Reading Steel Casting Co., Reading, Pa., and previous to that with the Detroit Steel Casting Co., Detroit, in Wyomissing, suburb of Reading, Feb. 20.

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Ernest T. Bros, 42, vice president and general manager of the William Bros Boiler & Mfg. Co., Minneapolis, in Cleveland, Feb. 21, where he was attending a meeting of the American Boiler Manufacturers association. He had been the executive head of the boiler manufacturing company since the death in 1928 of his father, William Bros, founder of the company.

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Dana G. Griffin Sr., 62, who gained international recognition as a hydraulic engineer in connection with his work on the Hudson river tunnel in New York over 30 years ago, in Fort Worth, Tex., Feb. 26. He went to Fort Worth in 1910 and shortly thereafter became superintendent of the city water system. In recent years he had been Texas representative for the Bruce-Macbeth Engine Co., Cleveland, builder of stationary gas engines.

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Franklin Moeller, 70, manager of the New York office of Wellman Engineering Co., Cleveland, in East Stroudsburg, Pa., as a result of an automobile accident, Feb. 24. From 1900 to 1927 his headquarters were in Cleveland, where he was associated with the former Wellman-Seaver-Morgan Co., now Wellman Engineering. He was a member of the American Society of Mechanical Engineers and the American Institute of Mining and Metallurgical Engineers.

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William S. Elliott, 72, one of the pioneer machinery manufacturers of the Pittsburgh district, in Pittsburgh, Feb. 21. He was president of the Elliott Co., Jeannette, Pa., and vice president and director of the Lagonda Mfg. Co., Springfield, O., and the Liberty Mfg. Co., Pittsburgh. Resident of Pittsburgh since 1896, he was a member of the American Society of Mechanical Engineers, the Engineers' Society of Western Pennsylvania, and the Engineers' club, New York.

Meetings

THIRTY-FOURTH annual dinner of the Traffic Club of Pittsburgh will be held at the William Penn hotel, March 7. Robert Main, president of the club, has announced a speakers' committee composed of John E. Coakley, general traffic manager, subsidiaries of United States Steel Corp.; J. M. Morris, president of the McKeesport Connecting railroad, and E. W. Smith, vice president, Pennsylvania railroad.

EDITORIAL

Weirton Decision Will Speed Showdown on Labor

THE decision of Federal Judge John P. Nields in dismissing the United States government's suit against the Weirton Steel Co. will go a long way toward bringing order out of chaos in the almost hopelessly muddled labor relations situation.

In brief, the court holds that:

1. The Weirton Steel Co. is not engaged in interstate commerce, and further, the relations between the company and its employes do not *affect* interstate commerce.
2. Section 7a (the collective bargaining clause) of NIRA is unconstitutional and void as applied to the Weirton Steel Co.
3. The company has not coerced its employes into joining the employes representation organization.
4. The employe representation plan in effect among Weirton employes affords a lawful and effective organization for collective bargaining through representatives of their own choosing.

So overwhelming is the victory for the Weirton Steel Co. and so far reaching are the rulings in their adverse effect upon the efforts of the federal government and A. F. of L. that it is practically certain that the case will be appealed to higher courts immediately. In the meantime, the decision will afford a wholesome stimulation to those who have been battling against odds for a continuation of the open shop principle. In particular, the ruling is encouraging to the millions of employes in all industries, who, desiring no professional union affiliation, choose to bargain directly with management or through the agency of an employe representation organization.

Wilmington Ruling Will Intensify Struggle Between Open Shop and Closed Shop Forces

But the most important immediate effects of Judge Nields' decision will be to clarify the issues involved, to hasten a showdown on these issues and to intensify the conflict between the opposing forces. The outcome probably will be a fierce contest between the A. F. of L. and advocates of a closed union shop on one side and the proponents of the open shop on the other.

Consequently, industrial executives should not bank too heavily on the strength of the moral victory won in the federal court at Wilmington. Instead they should expend their zeal in preparation for the battle that is to come.

One phase of such preparation should be a continuation of the present effort to improve employe relations independent of government and A. F. of L. measures. Management should try to afford their employes such satisfactory means of collective bargaining through employe representation or of direct bargaining individually that no method involving outside agencies will hold any appeal.

Remember that another engagement of the age-old battle of the open versus closed shop is just beginning!

Engineering and Abuse of Reciprocity Will Not Mix

THAT perennial bugaboo—reciprocity—again is causing trouble. Two or more salesmen, or purchasing agents, or engineers, cannot talk shop more than 10 or 15 minutes without dragging the subject of reciprocal buying into the discussion.

The reason is obvious. Whenever business volume expands after a prolonged period of inactivity, competition is unusually keen. The sharper the competition for orders, the stronger is the emphasis placed upon reciprocity.

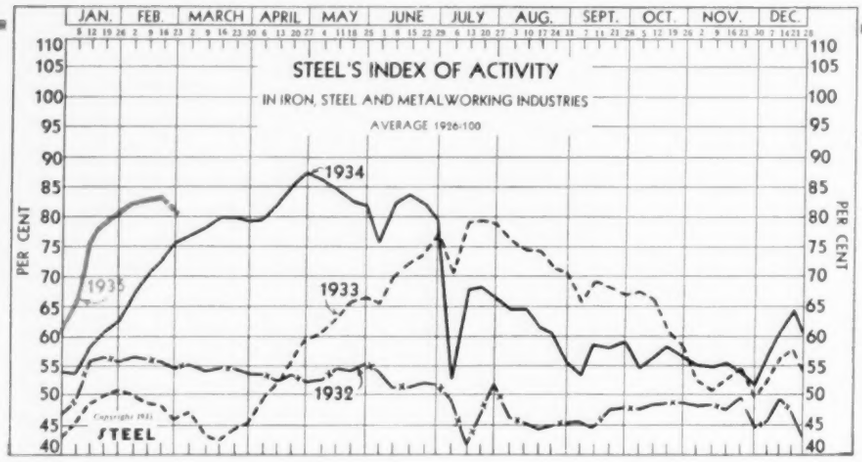
One cannot be too dogmatic in regard to the good or evil in reciprocal relations in industry. The desire to place an order with a good customer instead of a noncustomer is a natural trait. Certainly the fundamental principle of reciprocity is sound.

Why, then, is reciprocal buying condemned so bitterly today? It is because the idea of reciprocity is being abused. In too many cases, the trading of orders has been carried to the point of absurdity.

The effects of such abuses are particularly disastrous when the selection of engineering equipment is involved. Good engineering is the application of known laws to a specific problem to the end that it be solved correctly. To set aside engineering decisions in favor of reciprocal or "political" considerations is to deprive one's company of the advantages of specialized knowledge and experience. Continued practice of this abuse will lead inevitably to a serious breakdown in the efficacy of engineering.

Good engineering and excessive emphasis on reciprocity will not mix!

THE BUSINESS TREND



STEEL's *index of activity in the iron, steel and metalworking industries declined 2.2 points to 80.6 in the week ending Feb. 23:*

Week ending	1935	1934	1933	1932
Jan. 5	65.4	53.6	45.3	48.8
Jan. 12	73.8	58.1	48.6	55.8
Jan. 19	78.1	60.9	49.8	56.2
Jan. 26	79.5	62.3	50.8	55.8
Feb. 2	81.8	66.9	49.9	56.2
Feb. 9	82.7	70|7	48.7	56.0
Feb. 16	82.8†	72.4	48.3	54.5
Feb. 23	80.6*	75.5	46.0	55.1

†Revised. *Preliminary.

Wider Diffusion Offsets Recession in Activity

BUSINESS enters the third month at a level slightly below the peak of mid-February. The slowing of the pace of improvement, which became apparent late in January, continued throughout the short month and caused a definite downturn in the week ending Feb. 23.

In that seven-day period, which included a holiday, losses were sustained by revenue freight traffic, electric power output and steelworks operations. Concurrently automobile assemblies increased from 82,119 to 82,481. This was the smallest gain in any week since production on the present models began, and is considerably below the seasonal improvement normally expected at this time of the year.

The net result of the movement of these four barometers is a 2.2 point drop in STEEL's index of activity in the iron, steel and metalworking industry. This is the first break in a steady upward march which had spanned seven consecutive weeks. Barring a letdown in the week which included Christmas, it was the first reverse in 11 weeks, or since the week ending Dec. 1.

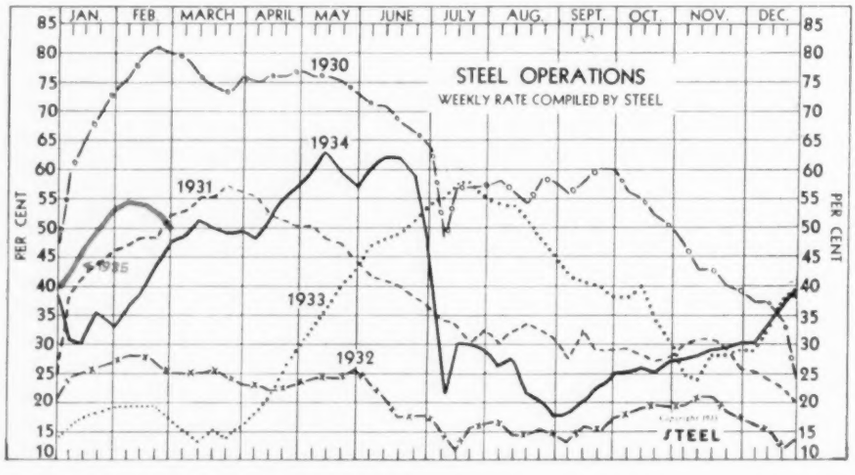
Now that a relapse—as yet slight in extent—has occurred, luncheon table debaters are trying to decide whether or not the peak of the present surge of activity has been passed. Only time will settle the argument.

Activity Better Diffused; Sustained Volume Is Preferable to Feast and Famine

A point usually overlooked in these discussions is that business activity is more widely and more evenly distributed today that it was in the peaks of 1933 or 1934. The federal reserve board index of industrial production touched 100 in July, 1933, and stood at 90 in January, 1935. However the diffusion of activity was much broader in January than at the 1933 peak.

Industry can show better returns on an even, sustained volume at present levels than on the quick spurts and sickening slides which have characterized the trends of the past two years.

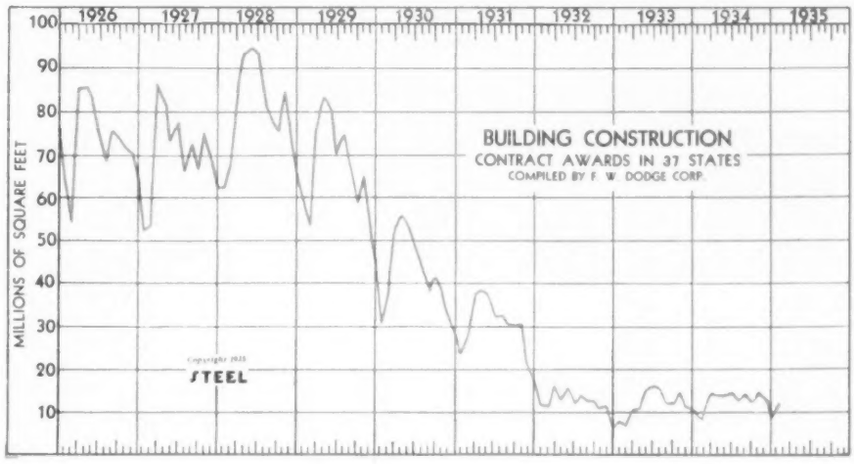
1935	Per Cent
Feb. 23	50
Feb. 16	53
Feb. 9	54.5
Feb. 2	54.5
Jan. 26	53
Jan. 19	51
Jan. 12	45½
Jan. 5	42½
1934	
Dec. 29	39
Dec. 22	37½
Dec. 15	33½
Dec. 8	30
Dec. 1	28
Nov. 24	29
Nov. 17	28



1934	Per Cent
Feb. 24	47
Feb. 17	43
Feb. 10	39
Feb. 3	36
Jan. 27	33
Jan. 20	35
Jan. 13	30
Jan. 6	31
1933	
Dec. 30	36
Dec. 23	38
Dec. 16	33
Dec. 9	29
Dec. 2	29
Nov. 25	28½
Nov. 18	28

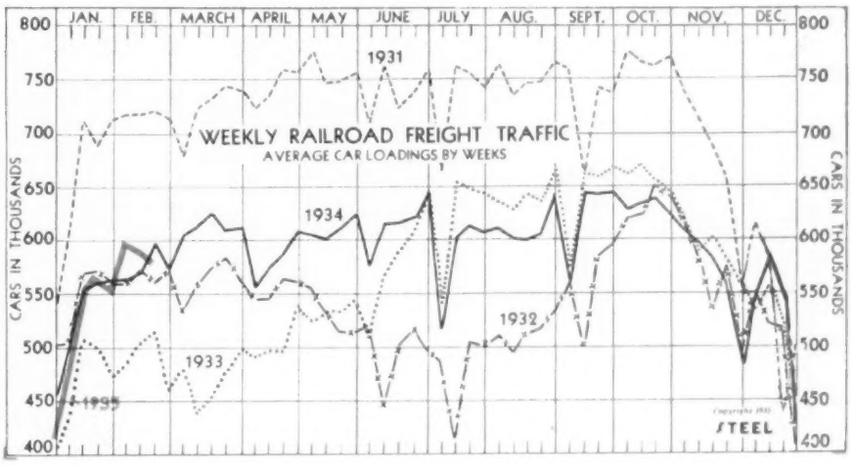
Building Construction Up Sharply in January

	Square Feet	
	1935	1934
January	11,245,100	9,568,700
February		8,176,300
March		14,788,900
April		14,207,100
May		14,664,400
June		13,986,500
July		13,250,000
August		14,259,000
September		12,510,300
October		15,098,100
November		12,780,800
December		9,193,300



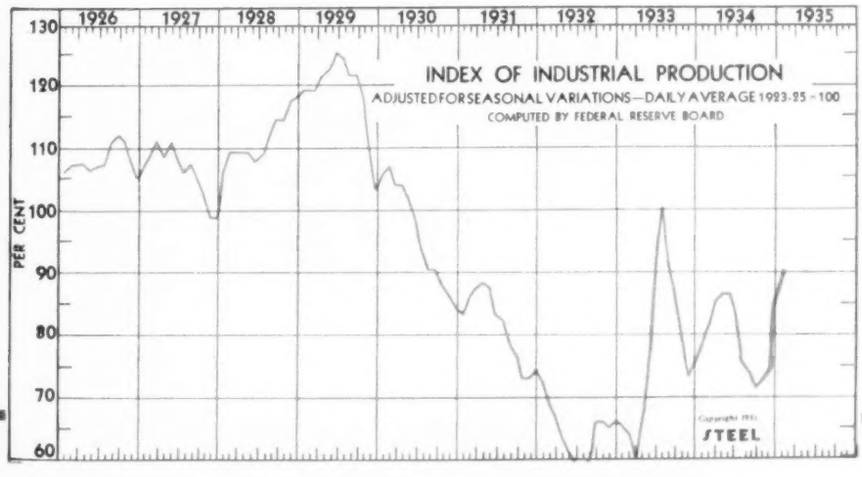
Freight Car Loadings Decline Slightly

1935	
Feb. 16	581,981
Feb. 9	592,560
Feb. 2	598,164
Jan. 26	555,768
Jan. 19	562,955
Jan. 12	553,675
Jan. 5	498,073
1934	
Dec. 29	425,120
Dec. 22	547,895
Dec. 15	579,935
Dec. 8	551,011
Dec. 1	488,118
Nov. 24	561,313
Nov. 17	584,525



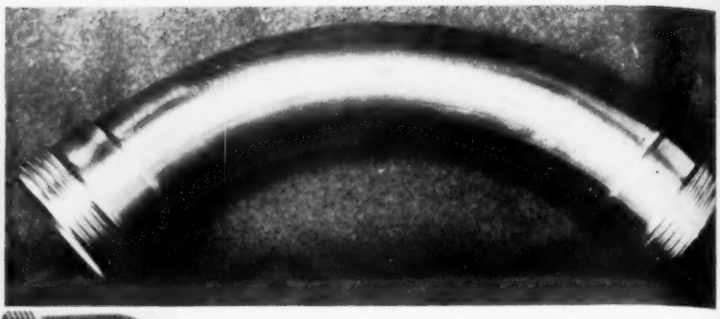
1934	
Feb. 17	600,268
Feb. 10	573,898
Feb. 3	565,401
Jan. 27	563,100
Jan. 20	561,902
Jan. 13	557,266
Jan. 6	500,813
1933	
Dec. 30	454,765
Dec. 23	531,464
Dec. 16	559,419
Dec. 9	541,992
Dec. 2	499,596
Nov. 25	585,738
Nov. 18	602,708

Industrial Production Highest Since August 1933



	1935	1934	1933
January	90	78	65
February		81	64
March		85	60
April		86	67
May		86	77
June		83	91
July		75	100
August		73	91
September		71	84
October		73	77
November		74	73
December		86	75

At the right is a 2-inch sanitary bend of stainless steel, with ferrules attached as at B *in sketch* 1. *Below are several cast stainless steel ells, maximum carbon content* 0.07 *per cent*



BY ALLAN W. BEATTY and
A. REED McCURDY
Pittsburgh Piping & Equipment Co.,
Pittsburgh

FABRICATING PROBLEMS BALK BROADER ACCEPTANCE OF 18-8 PIPING

EVERY year for the last 30 years, a certain Pittsburgh manufacturer has purchased 500 feet of 3-inch galvanized steel pipe. Every year, in this plant, a 3-inch line carrying an acid solution is completely disintegrated by corrosion and must be replaced; and every year sees first zinc, then iron contamination of the product, leaks, uncertainty, anxiety, a shut-down; new pipe, new fittings and installation costs. No changes are anticipated in product or process, and it is possible that the plant will operate for another 30 years.

Tests have indicated the deficiencies of various protective coatings and other metals in this application, but the fact has been established firmly that 18-8 stainless steel would last indefinitely.

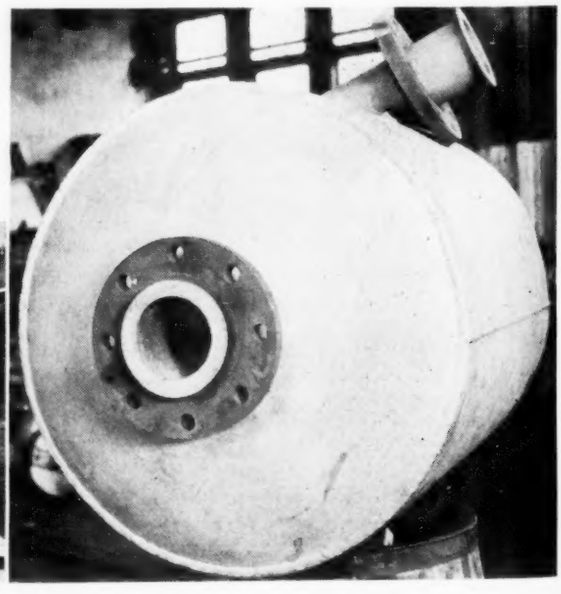
In a consideration of the cost of stainless steel and other piping materials, designers are not long in being influenced by its greater strength, and so light wall sections are the obvious practical result. In spite of the lack of need for corrosion allowance, the use of thin walls should not be carried to the extreme, for seamless 18-8 tubing is subject to various types of flaws which might pass even a close inspection and later cause failure. The use of B. W. gages lighter than 18 to 20 is questionable.

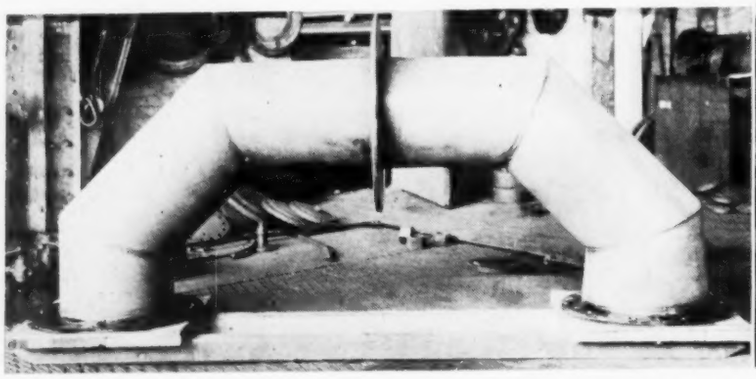
This year 500 feet of 3-inch galvanized steel pipe would cost approximately $200. Five hundred feet of 3-inch inside diameter by 16-gage 18-8 tubing would cost about $1175—less than six times the price of steel. Including installation costs of both materials, the stainless would pay for itself in five years, and with its other advantages would at least prove interesting.

However, at this point, dark clouds begin to gather in the chrome-nickel sky; for a lack of standard methods, fittings and valves with which to make a working unit of light-gage tubing is apparent. When costs of the available fittings and valves are considered, it is best not to draw any comparisons. For these reasons, the aforementioned Pittsburgh manufacturer installed steel pipe again this year.

A number of fabricating methods are being used in connection with 18-8 tubing. The food industries are using the well-known standard

NIPPLES on the 18-8 *steel separator (right) have laps as shown at* T *in sketch* 5. *Below is a* 22-*inch stainless crossover pipe and expansion joint with flange construction as shown at* Z *in sketch* 6





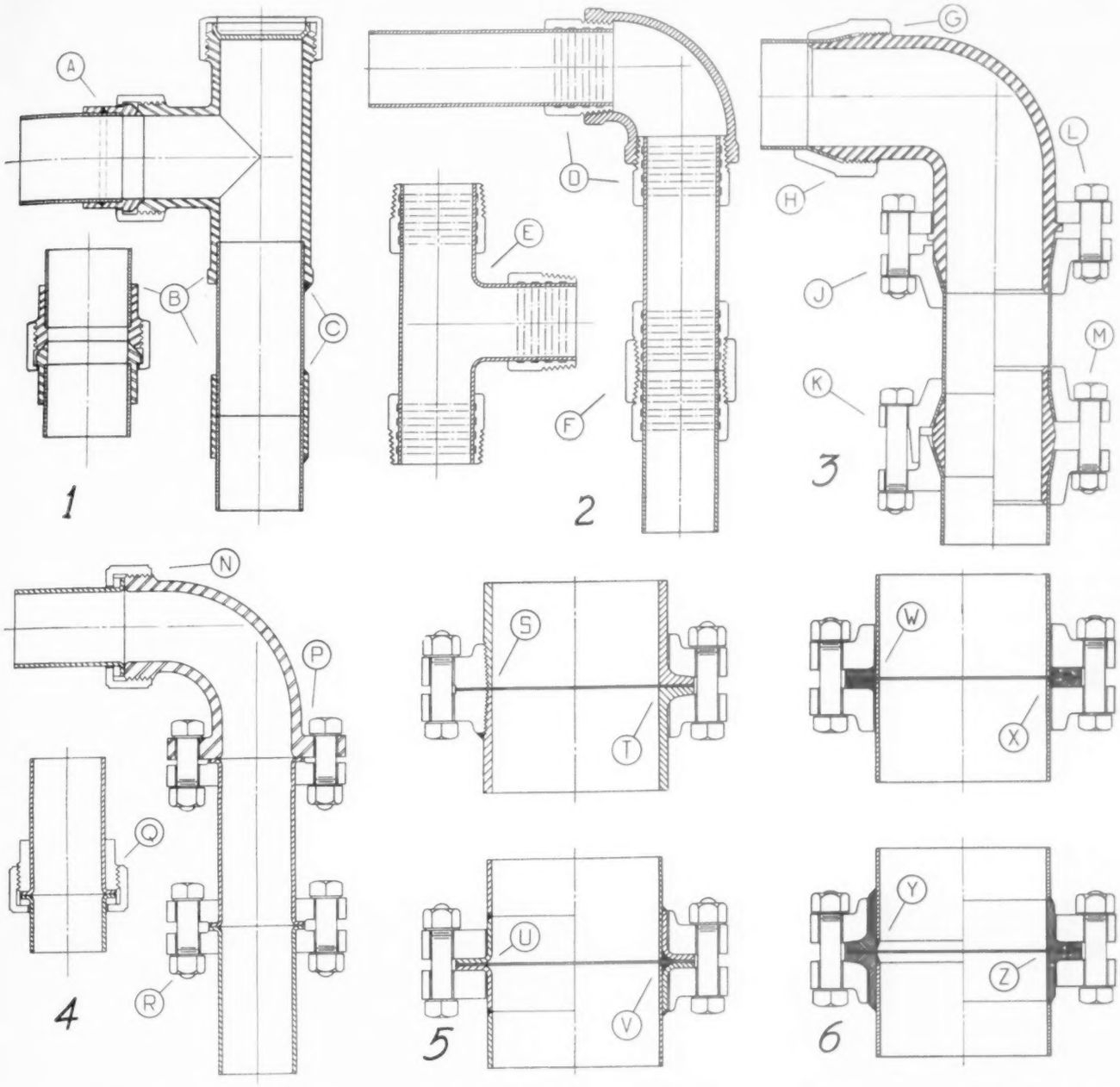
sanitary design shown in sketch 1, in which the tube is placed in a recessed fitting or ferrule as at *B* and sweated with soft solder, pure tin or silver solder. In order to introduce the solder more effectively, an annular groove is sometimes cut in the fitting as at *A* and one hole is drilled through the sidewall into this groove to the holes in a tube sheet. Tubes thus equipped can be used in conjunction with screwed pipe fittings of ordinary design. Full advantage of this plan comes when the tube ends are brought together as at *F* and this requires the use of special light weight fittings, *E*.

Sketch 3 indicates a type of joint in which the end of the light tube is flared slightly and this end is pulled up tightly on a correspondingly tapered section of the fitting or union ferrule by a flange or nut. Although the restricted flow types *G*, *L* and *M*, are more rigid and somewhat easier joints to make, smooth flow, full area connections, *H*, *J* and *K*, are entirely practical.

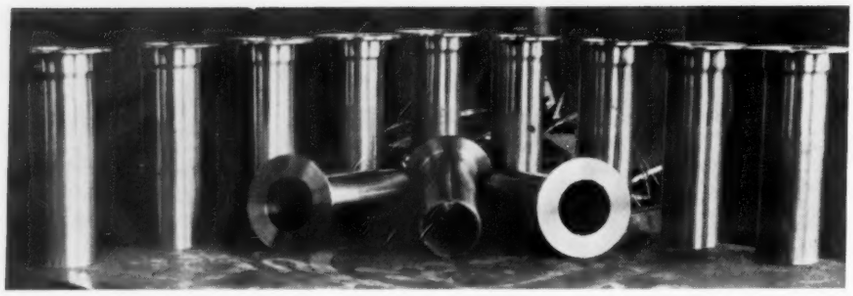
By the use of progressive sets of rollers, small Van Stone laps, shown in sketch 4, can be rolled cold on chrome-nickel tubing and, when backed by steel nuts and rings, *N* and *Q*, or flanges, *P* and *R*, this makes a rugged joint. The radius at the inside corner of the lap makes a pocket which is objectionable in some cases.

Considerable iron pipe size 18-8 tubing is threaded as in ordinary pipe practice and connected with screwed fittings or flanges as in sketch 5 at *S*. The seizing or galling tendencies of metal and its toughness and work hardening properties combine to make thread cutting difficult, especially on the larger sizes, and when a screwed joint is made up tight, in many cases through which the solder is fed. One manufacturer offers fittings with silver solder already in the groove. The seal also can be made by welding as at *C*. The idea of boring this type of fitting a few thousandths of an inch small and shrinking onto the tube, though metallurgically sound, has not proved practical.

Another method, sketch 2, is the use of a tube roller to expand the tubing into a flange or short section of threaded pipe as at *D*, the inside of which has been grooved similarly



SIX sketches showing a number of fabricating methods and fittings currently in use to make working units of light-gage stainless steel tubing. Explanations of the various assemblies appear in the text



Seamless 2-inch by 14-gage 18-8 steel nipples with laps attached as indicated at V in sketch 5

it is next to impossible to take it apart. The rolling of laps, *T*, is generally troublesome since 18-8 cannot be worked in the range below 1700 degrees Fahr., and all operations must be performed at heats above this temperature. This requires extra care and reheating. The metal also exhibits a reluctance to fill the corners of the dies. Angle rings formed from plate are used to make the single welded joint, *U*, and the more rugged, double welded, square corner type, *V*.

The use of rings cut from plate or made from formed bar and welded front and back as in sketch 6 at *W* has been found to make a joint no better than the simpler and easier method, *X*, of performing all the welding from the front in a larger vee. Cast alloy rings are used in the construction, *Y*. Rolled angles, formed into rings and butt welded, *Z*, make good laps for large size pipe.

Excepting the types wherein electric welding is employed with a subsequent annealing treatment, all these methods of fabrication are a compromise either with strength or corrosion resistance.

Soft soldered joints tend to crack after a time due to the high coefficient of expansion of stainless steel.

When 18-8 is heated in the temperature range of approximately 1000 to 1600 degrees Fahr., it is rendered susceptible to intergranular attack. Corrosion resistance is also impaired by severe cold working. However, rapid quenching from 1900-2100 degrees Fahr. restores the metal to a resistant state.

Resistance to intergranular attack has been increased by maintaining carbon content under 0.08 per cent; increasing silicon, or chromium and nickel content (19-9 minimum); and by additions of molybdenum, titanium, tungsten and vanadium; increasing or decreasing at the same time the general corrosion resistance and workability of the metal.

Excepting some recently developed low melting point types, silver solders must be applied at temperatures within the precipitation range, and joints so made have the same adjacent structure as unannealed welded joints with the disadvantage that annealing is impossible. The types of joints wherein the tubing is cold worked place the metal at a disadvantage to resist corrosion.

Effective annealing of 18-8 requires a good furnace, accurate temperature indicating apparatus and the maintenance of a neutral atmosphere. The piping should be braced adequately and protected from direct flame. Air quenching on light gages is sufficiently rapid, but all heavy sections such as flanges should be water quenched, or adjacent sensitized areas are bound to result. After annealing, resquaring generally is required.

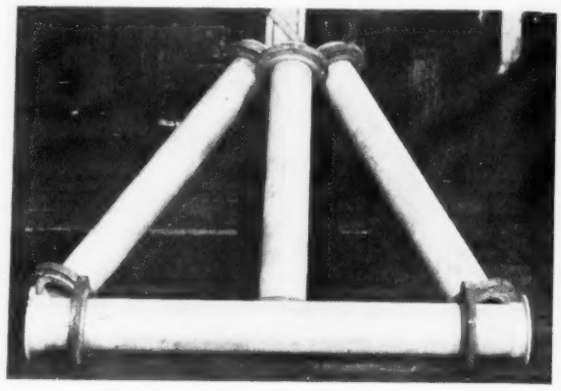
The good creep values of 18-8 steel make it an ideal metal for installations operating under high temperature and pressure—a subject beyond the scope of this article.

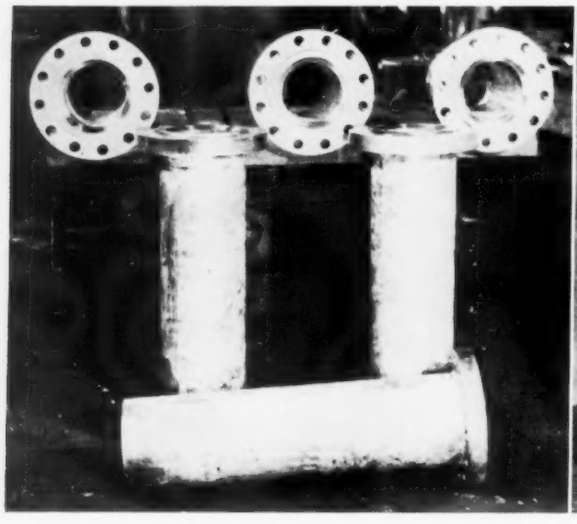
Chrome-nickel steel piping is being

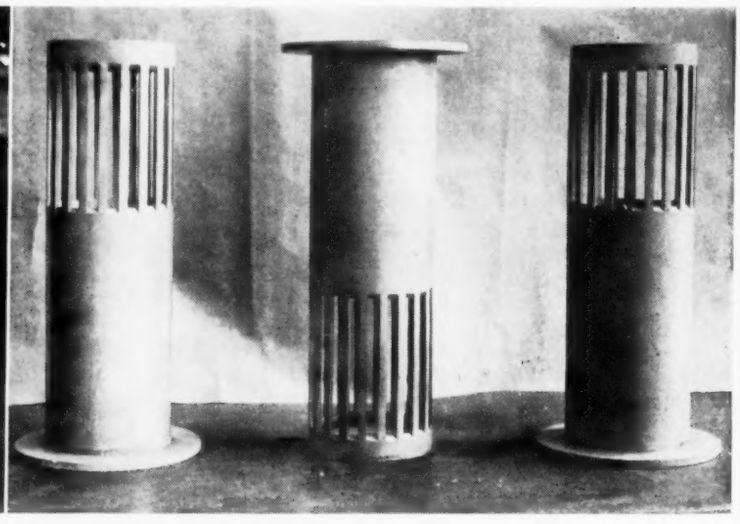
◆

HERE are shown four sections of 6-inch pipe fabricated from 24-12 chrome-nickel steel plate

◆







At the left are a number of 6-inch forged steel nozzles with 11-gage 18-8 liners flared over the raised face to include spherical gasket seat. At the right are three 18-8 strainers with laps attached as at X in sketch 6

used in most every industry where there is a severe corrosion problem. Seamless and electric butt welded tubing are most used. In the larger sizes and the modified alloys, considerable quantities of hand-welded pipe are used. Seamless stainless-clad steel tubing is so difficult to produce that no price advantage is attained.

Alloy gate and globe valves generally are satisfactory with all except light fluids. Plug cocks have a tendency to seize and arrangement is usually made for lifting the key before rotation.

In many early 18-8 piping installations, bronze valves and fittings were used. A large number of these jobs still operate in apparently as good condition as when erected. In other cases, the stainless failed rapidly due to electrolysis. No definite rules can be cited in this connection, although insulation would seem logical. The use of all alloy parts in contact with the material in the line is considered good practice.

Drawbacks Still Encountered

Considerable quantities of light-gage stainless tubing now are being used in such mildly corrosive applications as found in the dairy and canning industries. Generally, however, chrome-nickel tubing is not specified unless it is intended to take full advantage of its corrosion-resisting properties. These properties are only obtained in fabricated tubing (bends and welded joints) by the costly and somewhat hazardous procedure of annealing, pickling, retesting and resquaring.

It is generally conceded that the electric welding of light-gage stainless tubing is difficult and, in some cases, impossible; that gas welds are inclined to be porous or high in carbon, and that the use of modified alloys to resist intergranular corrosion without subsequent heat treatment is certainly a step in the right direction, but as yet cannot be considered the ultimate answer.

The opinion here expressed is not intended to detract in the least from the many excellent stainless piping installations now in service, but is rather the resultant impression of the fabrication and sale of many tons of alloy since it first became commercial.

However, the thinking buyer, who has considered all the points in connection with light wall 18-8 piping, and who is, by the way, the only substantial buyer, is still inclined to be hesitant.

This generally half-hearted acceptance of 18-8 as a piping material is not due primarily to cost, but to fabricating difficulties. The fact that so many methods exist of accomplishing the same purpose is an indication of the failings of each. Whether the solution will be a mechanical or a metallurgical one, we have yet to see, but the need stands as a potential challenge to engineer and metallurgist alike and not until this challenge has been met will the producers of stainless tubing enjoy the demand which is their due, nor will users reap the benefits of this modern material.

Flexing Fails to Destroy Enamel Film on Metal

Flexible lacquer now is being marketed which, according to tests, will not chip, flake or peel from the surface of cold rolled steel, brass and aluminum. When strips of either metal covered with a sprayed coat of the lacquer are bent backward and forward and then twisted and turned the coating shows no evidence of cracking.

No primer is necessary. Air-drying in regular lacquer time eliminates baking. No blushing occurs at relatively high humidities. The permanence of the adhesion is in the product itself, which with modifications, sprays, dips or coats and air-dries quickly. The product is manufactured by the Roxalin Flexible Lacquer Co. Inc., 800-814 Magnolia avenue, Elizabeth, N. J.

Huge Wrought Iron Canopy Depicts Life of Christ

A 25-ton balbachin or canopy roofing for the main altar of the Queen of the Miraculous Medal chapel, St. Joseph's college, Princeton, N. J., will be installed shortly by Kenneth Lynch Inc., medal craftsman, 8-14 Thirty-seventh avenue, Long Island City, N. Y. Made out of a single piece of wrought iron, the completion of the balbachin required two years. It is supported by four columns, each of several sections, forged and twisted. Under the canopy are eight panels in delicately hammered repousse, depicting events in the life of Christ. The work is reported to be valued at $50,000.

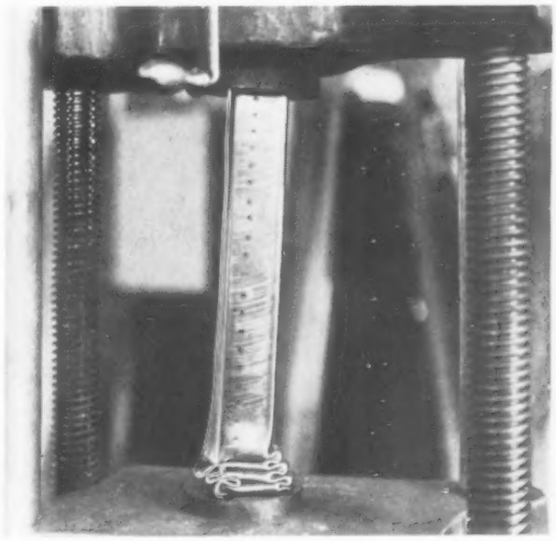
Welded Stainless Steel Box Sections Show Strength

The shot welded stainless steel box sections employed in the construction of the new streamline, articulated, diesel electric train known as the Flying Yankee, described in STEEL of Feb. 11, Pages 55 and 56, showed great strength when tested to destruction. The accompanying illustration shows a specimen of a section originally 14 inches long tested in compression and reduced to a length of 6 ¾ inches without a break in the material.

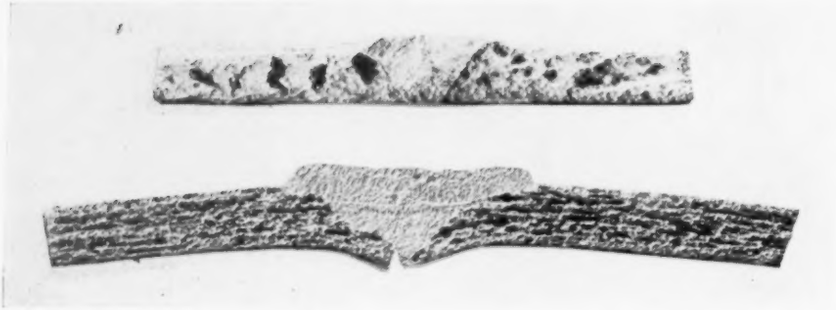
This member, of material 0.050-inch thick, has a sectional area of 0.51 square inch and weighs 1.77 pounds per lineal foot. Under compression it withstood 36,000 pounds, or more than 70,000 pounds per square inch. After failure had started the load required to continue the destruction varied up to a maximum of 28,000 pounds.

The section illustrated, owing to the varying nature of the imposed loads, had the least efficiency of any of those used in the structure. Others carry not less than 100,000 pounds per square inch under similar compression tests.

Tenacity of the welds also is indicated in the illustration. These welds all were made by the shotwelding system developed by the Edward G. Budd Mfg. Co., Philadelphia, builder of the Flying Yankee. Welds thus made develop a shearing strength of 75,000 pounds per square inch and withstand torsion up to 90 degrees before rupture.



Welded stainless steel box sections used in construction of Flying Yankee withstood compression loads varying from 70,000 to 100,000 pounds per square inch



Metals welded with like and unlike metals. (Top) The stainless iron has been strength welded with an electrode which deposited metal of an analysis similar to the analysis of the parent metal. (Bottom) The electrode had an entirely different analysis from that of the parent metal, yet the weld was most satisfactory. The specimen at the top was simply fractured transverse to the line of weld, while the specimen at the bottom was sawed, then acid etched to show contrast

Welding Less Frequently Used Alloy Steels And Other Alloys

BY MILES C. SMITH

Mechanical Engineer, Rich Mfg. Co. Ltd., Los Angeles

ALTHOUGH the decade just past has witnessed welding develop from a haphazard procedure for the joining of mild steel to a definite satisfactory process of fabricating all ferrous and many nonferrous metals, there seems to be a universal lack of general knowledge insofar as the welding of the less commonly used ferrous and nonferrous alloys are concerned. The writer has had the privilege of being identified with the development of products and procedure employed in such operations, thus it might be opportune to outline many of the concrete facts which have been learned and which could serve as a guide for others.

Welding Highly Specialized

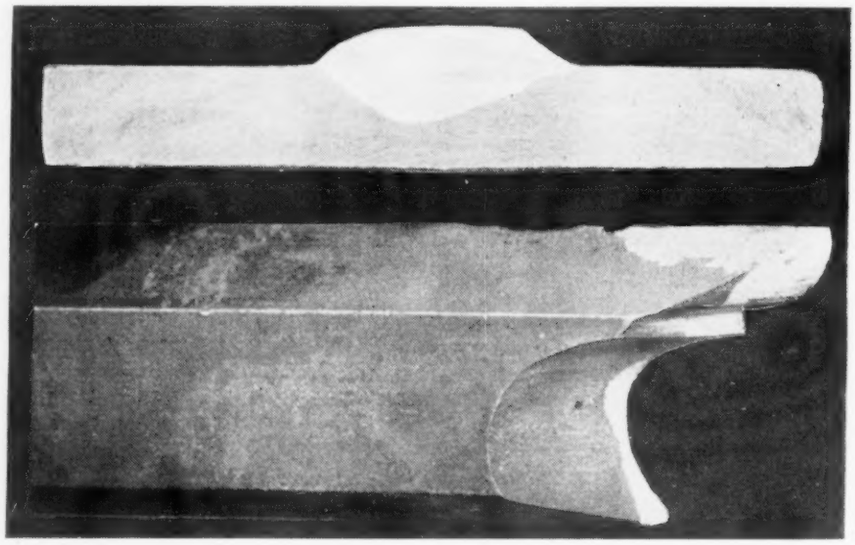
When it comes to the welding of ferrous alloys containing certain recognized percentages of chromium, molybdenum, nickel, tungsten, and other alloying elements, the welder who is more or less unfamiliar with these alloys seems to be pretty much up a stump as to the procedure and the proper welding rod or electrode to be used. Aside from being quite conversant with the performance of the more generally marketed mild steel welding rods and electrodes, the average welder has had little opportunity to school himself in the metallurgical principles necessary to make a success of what can as yet be termed "specialized welding".

Naturally, the welding of complex ferrous and nonferrous alloys, like any welding operation, resolves itself into the selection of a welding rod or electrode and a method to fuse this rod or electrode with the parent metal, but welders often make their first mistake in the welding of metals with which they are not familiar by not taking into consideration that the deposit formed at the weld does not necessarily have the same analysis as that of the rod they have used. The weld deposit is an amalgamated mass of metal which has been fused together and which consists of the residue of the welding rod or electrode employed to form the weld and whatever constituents of the parent metal find it possible to fuse in with the weld metal as it is deposited.

Coated Electrodes Necessary

We, here, because of the economy of the process, speed and ease of application, lean quite strongly toward the electric welding of the less commonly used alloy metals, both of ferrous and other bases. We also maintain that it is essential for the electrode to be provided with a flux mantle capable of keeping a gaseous atmosphere about the weld during its formation and depositing a protective slag over the weld after it has been formed. Furthermore, we are not particularly enthused with the often used method of introducing certain alloying elements in the flux mantle. This can be done, and at times is an easy and successful way out, but we have learned that much greater success can be expected if the alloying elements are in the body of the electrode and not in the mantle.

Since welding is a procedure in which metal is fused and allowed to flow in with and interalloy with the metal to be welded, electric welding, providing the proper heat is used—



Two examples of penetration. (Top) A single bead applied with the proper heat has puddled in with and amalgamated with the parent metal which is 0.30-0.40 per cent carbon steel. (Bottom) The uneven line of joining shows the penetration of a very delicate overlay for high-speed tool steel. The welded-on deposit is from an electrode of quite complex analysis, containing cobalt, chromium, and other metallic elements with only incidental iron in each instance

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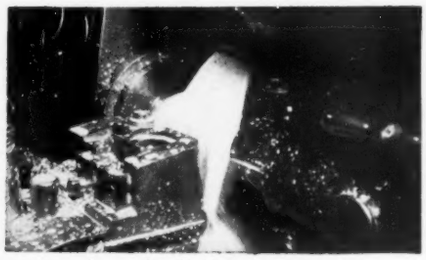
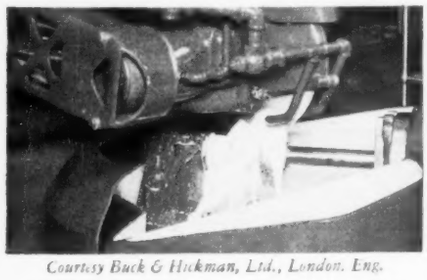
These pictures continue a series of illustrations showing the widespread use of Sunoco, a series presented for the past ten years through the medium of the trade's magazines.



Courtesy Ray Day Piston Co., Detroit

Operation: Rough and finish grooving piston for rings. **Machine:** Sundstrand Automatic Grooving Machine. **Material:** Aluminum. **Speed:** 943 R. P. M. **Size Of Groove:** ⅛ in. by ⅛ in. **Lubricant:** 1 part Sunoco to 50 parts water.



Courtesy Buck & Hickman, Ltd., London, Eng.

Machine: Pratt & Whitney 10 in. Helical Gear Grinder. **Material:** Chrome Nickel Steel. **Wheel Diam.:** 10 in. **S. F. P. M.** 5000. **Stock Removal:** .010 in. **Coolant:** 1 part Sunoco to 40 parts water.

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THE fusion line of a weld magnified 100 diameters to show the intermingling and interalloying of the weld metal and the parent metal

that is, the proper amperage is passed through the electrode—and if the voltage is only sufficient to maintain the arc and carry the deposited metal across the arc, will, if the analysis and flux mantle of the rod or electrode is what it should be, effect a complete alloying, amalgamating or intermingling of the liquid electrode metal with the parent metal, and there will be little opportunity for overheating the parent metal adjacent to the weld.

But these determinations are not so simple in the welding of many of the less commonly used alloys, for some of the alloying elements in such parent metals will be drawn from the composite metal easier than from others. Some of them are more responsive to alloying with iron than others. Some even go off as gases under the high heat of the welding procedure. Consequently, in the determination of a rod or electrode for any particular metal or to accomplish any particular purpose with that metal, whether it be to provide strength, wear-resistance, resistance to corrosion or what, it is essential that every elemental constituent of both the parent metal and the rod be taken into consideration and its action under the excessive heat of the electric arc be known. Unless every metallurgical principle involved is known and provided for, there can be no hope for success.

Amperage Must Be Correct

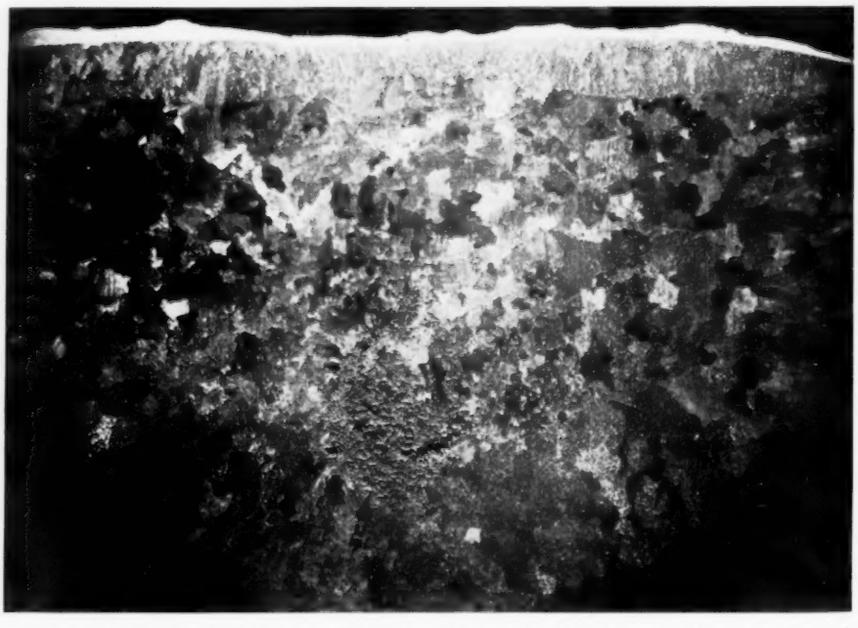
Furthermore, in the electric arc welding of the less commonly used metals, there seems to be a gross lack of the knowledge necessary for the welder to determine the proper amperage or heat at which a welding electrode should be applied. There can be no set recommendation to cover this. Neither can there be any set schedule developed for any one electrode. Machines vary in output. More than that, the skill and performance method of the welder must be taken into consideration. Then there is the thickness of material being welded as well as the ability of the material to conduct heat away from the weld area to be reckoned with.

Copper, for example, when nearly pure, conducts heat away from the weld area so rapidly that the electric welding of copper has been pretty much of a stumbling block unless the copper is preheated sufficiently to take the chill off and counteract the heat conductivity. A skilled welder, on the other hand, can weld copper without preheating and accomplishes practically the same or equivalent effect as preheating through a manipulation of the arc. One favored way is to strike an arc and wait momentarily until a sizable puddle actually forms and then proceed along with the bead only as rapidly as there is adequate penetration. By this method the arc does the preheating.

Determining Proper Amperage

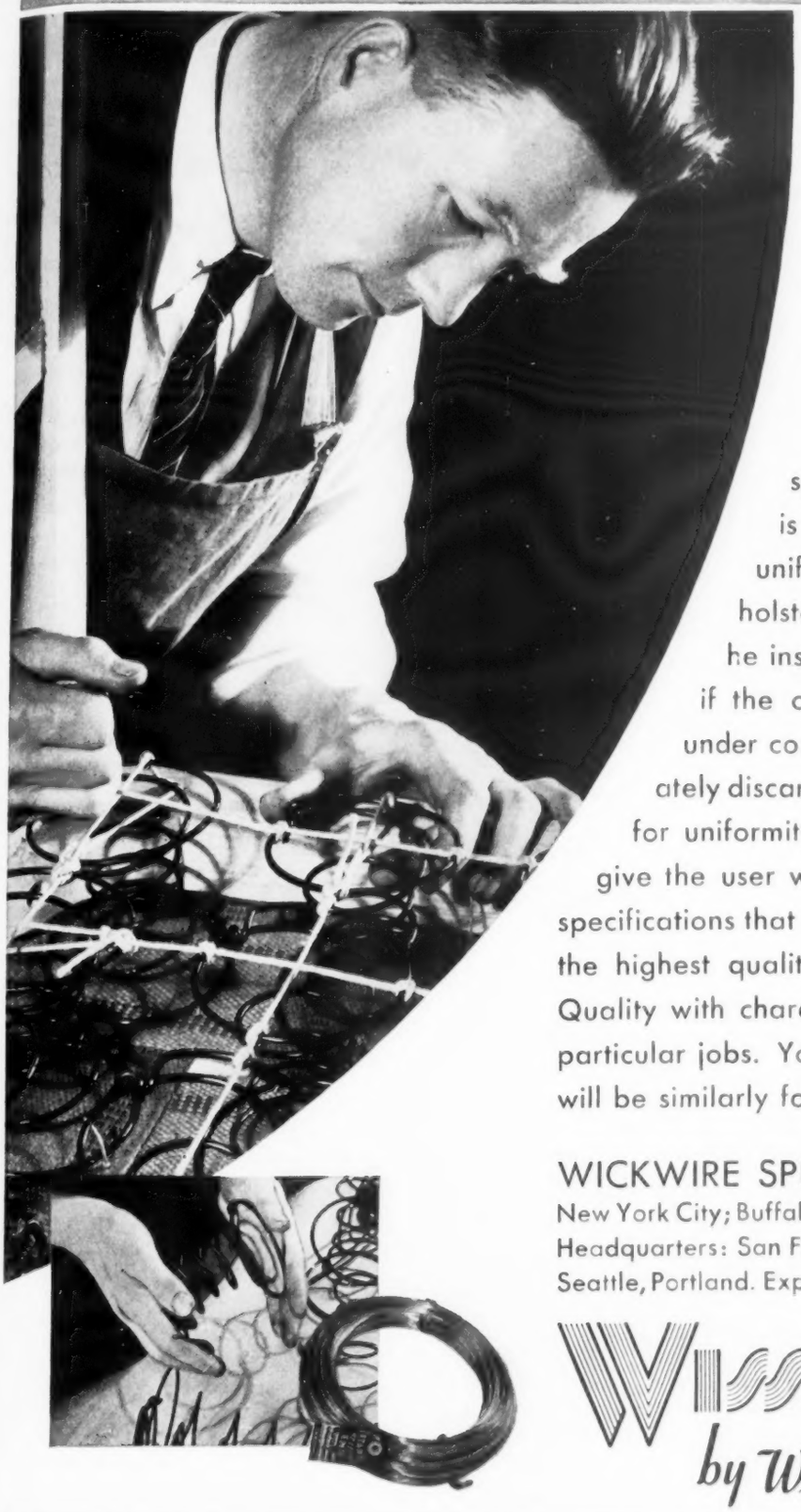
To determine the proper amperage to use, a welder must watch his electrode and see that first of all he has enough heat to insure good penetration or at least sufficient penetration for the needs of the weld. By penetration we mean the depth to which the molten electrode metal sinks into and interalloys with the parent metal. Then he must be sure that the heat is not excessive, that the metal is molten and not boiling. In the case of certain types of welding, cast iron welding as an example, it is often necessary for the welder actually to puddle the weld metal in with the parent metal as it is deposited. This puddling process insures that the alloying in the weld area of the electrode metal with the parent metal is complete. Otherwise porosity and poor weld are sure to result.

Generally speaking, the determination of the proper amperage is pretty much a matter of judgment, resulting from long experience, yet there are certain metallurgical principles which can serve as a guide,



Section through a built-up manganese steel rail showing structure of parent metal and welded-on deposit. Welding was done with a manganese steel electrode. Magnification 9 diameters

he dictates Wire Specifications



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Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Machinery Spring Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

for example, the normal fusing point of the parent metal and the recommended heat for the electrode. Should the parent metal contain alloying elements which are unusually delicate or which possess uncommon characteristics, successful welding cannot be hoped for until all the characteristics, including the fusion point, are known and provided for.

Work Requires Patience

In the author's experience, many and sundry welding rods and electrodes have been devised for both strength welding and hard surfacing or overlaying to form either a wear-resistant or corrosive-resistant surface, which have at first been praised, then later condemned. During the pioneering days it was often the case that a welding rod or electrode having what appeared to be the proper analysis and possessing the proper characteristics after it was successfully fused down with one parent metal would, when it was applied to other parent metals, give a very poor account of itself. Welders who were quick to condemn or restrict the use of such rods and electrodes did neither themselves, the product nor welding in general justice. The failures, as a rule, resulted from lack of knowledge and lack of industry and the patience necessary to adapt the welding procedure to the conditions at hand.

The welding of any parent metal is a highly specialized operation metallurgically and merits the exercising of all possible pains and care. When it comes to the welding of the less commonly used parent metals, care is doubly imperative. For, regardless of the merit of the welding rod or electrode used, the success of the operation is pretty much up to the welder.

Years ago, and even now in some quarters, it was considered necessary to have the analysis of the welding rod or electrode used identicallly the same as that of the parent metal welded. This is pretty much of a fallacy. The analysis of the rod or electrode should be such as to produce the required or desired analysis at the weld, but it need not necessarily be identically the same as that of the parent metal.

Of late, our laboratory has been conducting a rather interesting series of tests with an electrode, the chief constituent of which is copper.

Use of Copper Electrodes

As everyone knows, copper often is employed as an alloying element in steel. Many copper-bearing steels are marketed as "merchant metals" and are offered as having quite desirable properties for general use. So it is not surprising that a copper-bearing electrode would alloy with steel of practically any analysis to form a weld. However, to us it has been interesting to analyze the weld formed when copper electrode is used to strengthen weld steel, cast iron and ferrous alloy metals of varied and varying carbon content and various and varying alloying element content.

In every instance, the weld formed with the copper electrode has been sufficiently strong and sufficiently solid to fulfill all ordinary requirements, but, upon examination, the weld tells us that those elements in the parent metal which are more readily drawn to copper than the others are the first to leave the alloy parent metal and flow into the body of the weld.

The same thing has proved true when other types of parent metal were welded with welding rods and electrodes of a different analysis from that of the parent metal. We have purposely used a monel electrode for the electric welding of cast iron with exceptionally good results when it was essential that the weld have a very low coefficient of expansion and contraction. We have used a chrome-vanadium electrode for the welding of tool steels and high-speed steels with tungsten content and it is quite surprising in this instance to ascertain the percentage of tungsten present in the weld area.

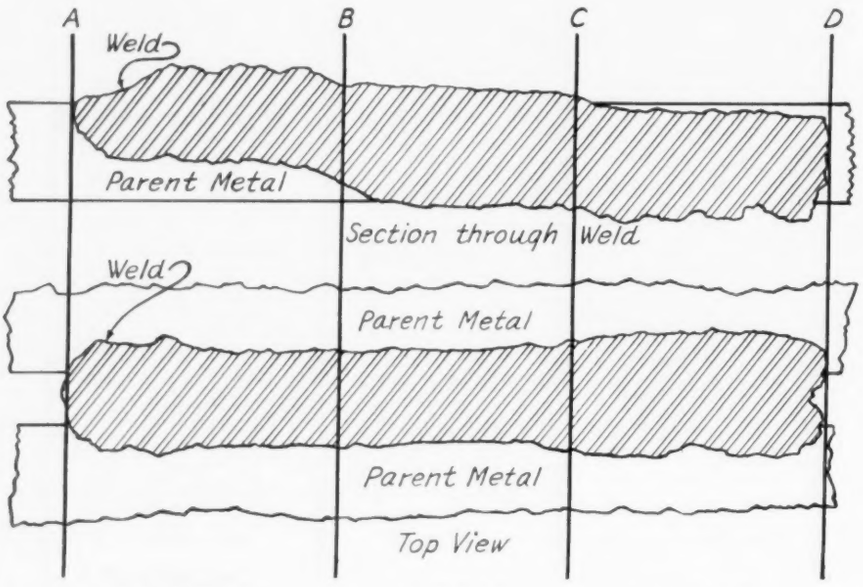
Chosing the Right Electrode

We could go on and on, citing examples without end, but each one would simmer down to a repetition of the identically same basic facts. With the proper care and pains a good weld is assured, and the composition of the metal in the weld area is a composite alloy of the parent metal welded and the rod or electrode used. Exactly which or what rod or electrode should be selected depends altogether upon the analysis and properties desired in the weld area.

Consequently, we have convinced ourselves that the selection of welding rods or electrodes to be used in the welding of the less frequenlty used metals resolves itself into a metallurgical problem. First determine the physical properties desirable in the weld, then select a metallic analysis which will, after it has been fused with and interalloyed with the parent metal, solidify into a metallic body which possesses those desired properties.

Insofar as process in the welding of special alloys is concerned, though, there seems to be much for the average welder to learn. Few welders appear to grasp immediately the importance of welding machine regulation.

First of all, few welders evidence a complete understanding of polarity in direct-current welding. Why and



Section A-B

AMPERAGE TOO LOW

Weld metal not at the proper temperature. The deposit balls up on the surface and may be spongy. Penetration is too shallow. Interalloying with the parent metal is incomplete

Section B-C

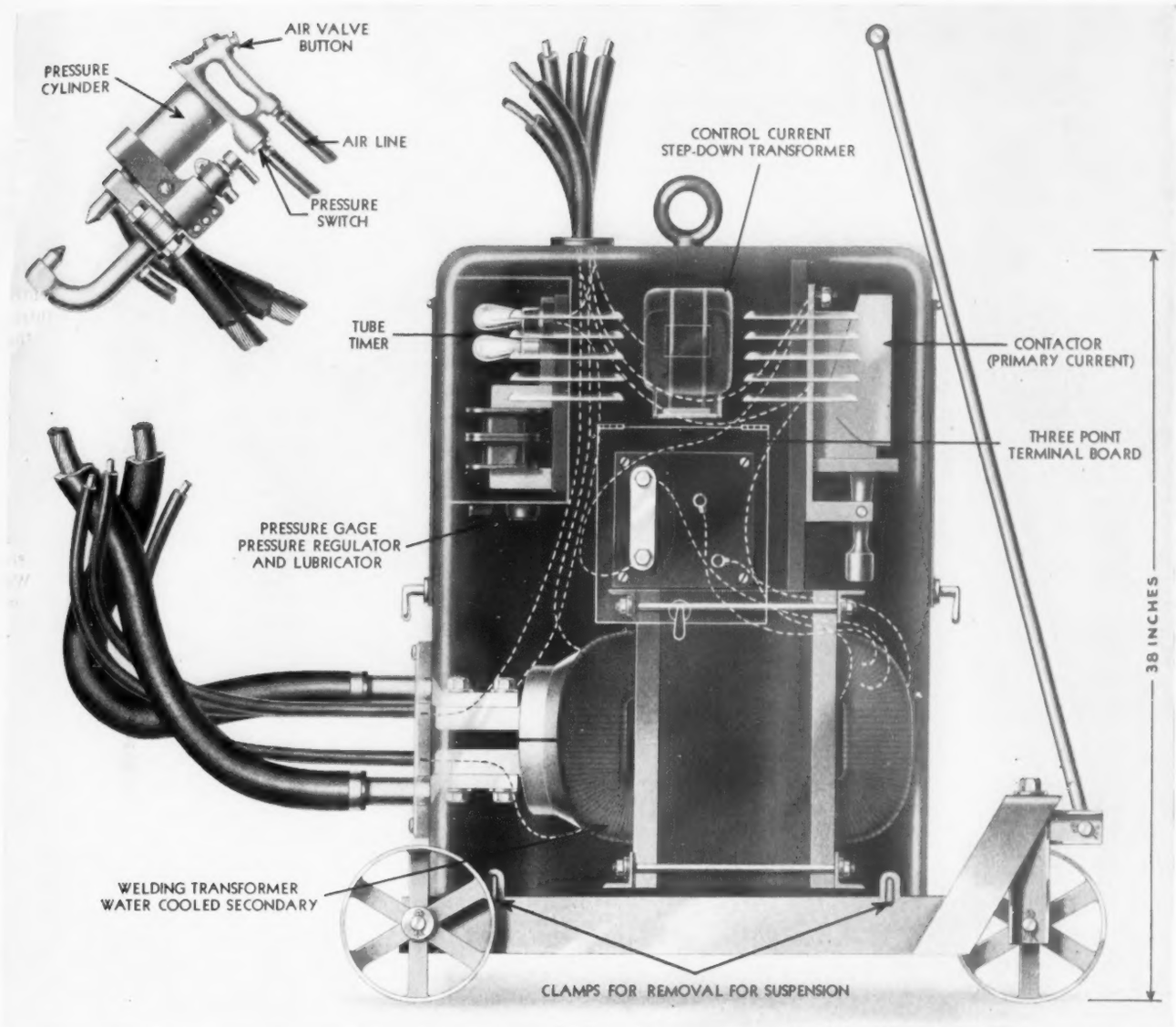
AMPERAGE O. K.

Weld metal at the proper temperature. Smooth surface on weld. Adequate penetration. Interalloying with parent metal is complete and no elementary constituents of either the weld metal or parent metal are lost

Section C-D

AMPERAGE TOO HIGH

Weld metal shows evidences of boiling. Weld widens out. Penetration too deep. Interalloying incomplete. High heat generates gases, forming inclusions in weld deposit. If delicate alloying elements were present in either parent metal or weld metal, they have been destroyed or driven off. Formation of overheated areas on either side of weld is probable



New Thomson-Gibb GUN WELDER

A super-portable machine that brings the speed and economy of production welding to a wide variety of products.

It combines unlimited *mobility* with maximum convenience. It can be wheeled to the work on the truck or demounted and suspended from a traveling hoist. It is entirely self contained, with transformers, regulators, timers, and contactor all housed in a single unit. It is equipped with a standard gun that can be fitted with a wide variety of interchangeable yokes to adapt it to any shape. It produces uniform, perfectly timed welds at high speed.

Write for a new bulletin which describes this machine in complete detail.

THOMSON-GIBB ELECTRIC WELDING CO.

•

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Thomson-Gibb Electric Welding Co.
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Please send me the bulletin which illustrates and describes the new Thomson-Gibb Portable Gun Welder in complete detail.

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Company .....

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6213

when should the polarity be reversed? If the supplier of the rod or electrode used does not state the polarity, the welder is usually up a tree.

Practically all electrodes used in the welding of the less commonly found alloys require reversed polarity. That is, they should become the positive pole of the direct-current arc circuit, because the greater heat should be centered upon the electrode and not upon the parent metal. We maintain that there is a decided advantage in having the electrode as the positive pole and provide for it. However, it is no hardship for the welder to test his electrode for polarity when he is not sure of the manufacturer's intention. Running an electrode with the wrong polarity leaves nothing to the imagination. The contrast in the electrode's behavior when run right and wrong is very marked.

Determining the proper heat, on the other hand, does not always take on the guise of simplicity. It should, yet it does not. Apparently, the rank and file of the welding fraternity possess a wide divergence of opinion as to what the appearance of a weld deposit should be when the proper heat is used. No doubt many welders will even disagree with us when we state our methods and practices. For us, though, they have proven adequate and accurate.

Welding Heat Is Critical

In the welding of mild or low-carbon steels, the variance of heats applied to the electrodes will, if kept within certain limits, not necessarily mean failure, but in what we have termed "specialized welding" it most certainly will. To weld alloy metals successfully, the heat must be right. Oftentimes, there is a working range of but a few degrees in temperature, so only a few amperes of current.

First of all, as has been stated, there must be adequate penetration and adequate penetration can only be produced when the electrode fuses down sufficiently rapidly to melt the parent metal to the required depth. Then there must be enough heat to deposit the weld metal as rapidly as and no faster than desired. The deposited metal should be relatively smooth upon its surface and solid when fractured. Too much heat or too little heat can result in porosity, but excessive heat is the most dangerous and least desirable. Welds deposited with too little heat will be rough and the deposited metal will have a tendency to ball up. Then, too, as the electrode melts down there is apt to be excessive sputtering of the arc. Welds deposited with too much heat also will be rough, and they will be porous, showing that the metal has been boiling as it was deposited. In what we have termed "specialized welding" neither the parent metals nor the welding rods or electrodes will stand up under abuse.

Undoubtedly, welders who have failed in welding the less commonly used metals successfully, have failed because there was not enough preparation made for the welding and enough care used during the operation. The temptation to base all procedure upon and compare all results with the method and successes in present-day mild steel welding is so strong that the average welder will not take the time and pains to weld the alloys successfully. Any and all ferrous and the majority of nonferrous alloys may be easily and successfully welded by the electric arc and the procedure is not necessarily complicated, but the welder must exercise both knowledge and care to do it.

Wire-less Antenna

TOWER ANTENNA: This 320-foot steel tower is the antenna for radio station WDOD, Chattanooga, Tenn. Built by the Truscon Steel Co., Youngstown, O., the tower is self-supporting and insulated from the ground, the current from the transmitting equipment radiating from the tower itself instead of from the customary antenna wires. Insulators at the base must support not only the weight of the tower but also must resist the overturning effect of wind load. To minimize the latter the upper structure is entirely of round bars, wind pressure on this type of bar being less than on flat bars. A similar tower, 350 feet in height, is now being erected for station WADC at Akron, O.

Iron and Steel Statistics Of World in One Volume

Statistics of the Iron and Steel Industries, published by the British Iron and Steel Federation; cloth, 244 pages, 7 x 9¾ inches; supplied by STEEL, Cleveland; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London.

The British Iron and Steel Federation has issued its annual book of statistics of the iron and steel industries. The new edition follows in the main those of the past 13 years, with some additions to make the statistics relating to various countries more complete.

The section relating to tariffs has been expanded by addition of further items to various countries, and brought up-to-date at the time of going to press. The duties on iron and steel products imported into the United Kingdom are explained in detail.

The book gives statistical information on production, foreign trade, etc., relative to every country in the world. The statistics of the United Kingdom are given in full detail, and for that country, as well as for the other major iron and steel producing countries, production and foreign trade statistics are complete up to the year 1933.

The tariff section, which covers 90 pages, gives the import duties on iron and steel products for the various countries of the world. Preceding this section are two tables giving world production figures of pig iron and steel from 1868 to to 1933.

Porcelain Enamel Booklet Shows Color Combinations

In a new "At Your Service" booklet which the Ferro Enamel Corp., 4150 East Fifty-sixth street, Cleveland, has just prepared for distribution, has been incorporated a novel feature. The cover is clear cellophane laminated onto white cover stock to simulate a white enameled surface. Supplied with the booklet are small sheets of red, yellow, blue and green cellophane, which when placed one at a time under trademark cutouts in the cover make it possible to visualize a variety of enamel color combinations. Colors and shades thus composed can be duplicated with oxides supplied by the company.

The text of the booklet sets forth the services which the company makes available to its customers. Upon request, the company will send copies of the publication to those interested in the subject of enamel finishes.

Fig. 1—Air conditioning cabinet of prefinished sheets, formed, flanged and assembled by bolting and cold riveting. Note grained wood finish

Prefinished Sheets Cut Assembly Costs

BY HAROLD B. VEITH

STEEL sheets on which the finish coatings have been applied before the material goes into the processing operations (STEEL, June 4, 1934) have captured the interest of engineers in practically all phases of the metalworking industry. The innovation offers one avenue for obtaining attractively finished products and machines employing steel sheets without the expense and labor of applying the lacquer film after the unit has been built. In other words, when the units are being assembled their progress is expedited by elimination of interruptions caused by the usual spraying or enamel baking and other such operations.

One of the striking examples of the strides which prefinished sheets have made is found in the automotive industry. Instrument panels and window moldings in many popular makes of cars are formed, stamped and cut from sheets on which a synthetic film of veneer has been applied previously.

In addition to the economy of fabricating parts directly from the prefinished sheet, another feature perhaps is even more inviting. By a photographic process a faithful reproduction of wood grain or other natural effect may be obtained. If the new process offered nothing more than the latter advantage it would be more satisfactory from an appearance standpoint than an attempt to copy grain effects by priming, graining, lacquering and rubbing.

Application of the prefinishing process to sheets also makes possible the covering of the metal with such designs as inlays to give the impression of expensive cabinet work. Four or five color combinations now are available to increase the scope of this accomplishment. In addition to the foregoing, typical reproductions include etched metal, marble and modernistic color designs; even some famous paintings have been reproduced with exceptional integrity.

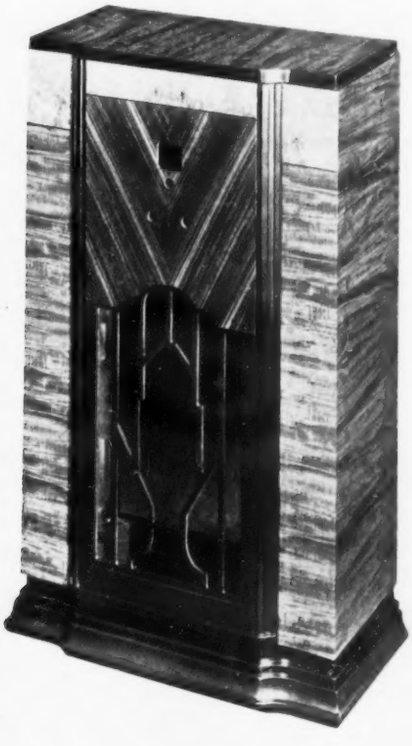


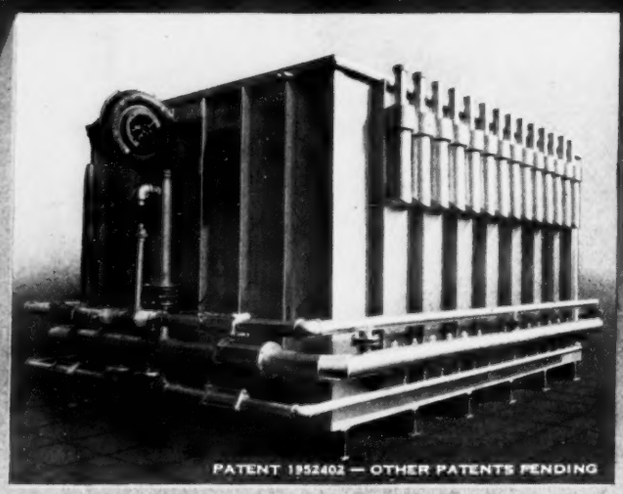
FIG. 2—Striking effects are obtained on this radio cabinet by a combination of wood and prefinished sheet steel

Extensive Market Seen

The fields for this material that hold promising possibilities as markets are extensive. Vending machines, air conditioning cabinets, refrigerators, radio cabinets and the like, are only a few of the units being considered. Business machines and domestic equipment are particularly adapted to the application of prefinished sheets. Tests show remarkable resistance of this type of finish in continuous exposure to heat, cold, salt spray and the ultraviolet ray.

The radio cabinet, Fig. 2, represents an interesting use for prefinished material. Because this type of unit sometimes embodies a combination of wood and metal, the pre-

(*Please turn to Page* 58)



45 Wilson Annealing Units have been purchased by Leading Sheet Producers.

"LET'S LOOK AT THE RECORD"

~~5~~	Wilson Annealing Covers	sold	prior	to	October 5th, 1934
~~15~~	"	"	"	"	"	November 10th, 1934
~~20~~	"	"	"	"	"	December 15th, 1934
~~28~~	"	"	"	"	"	January 10th, 1935
45	"	"	"	"	"	February 18th, 1935

Over 50% of the above Installations are repeat orders.

- ★ Reduced Annealing Cost
- ★ Short Annealing Cycles
- ★ Controlled Temperature Regulation
- ★ Maximum Tonnage Annealed through the use of Special Inner Covers

The

WEAN ENGINEERING

Company Inc.
Warren, Ohio

The Wilson Annealing Units sold by us are an exclusive development of

LEE WILSON ENGINEERING COMPANY • CLEVELAND, OHIO

METHODS AND MATERIALS

Alloyed Gray Iron Gains 50 Per Cent Over 1933

Production of alloyed gray iron in 1934, according to an estimate, was equal to that of the peak year 1929, an improvement over 1933 of 50 per cent. Alloy developments have had a stimulating influence on the gray iron industry. In investigating the effect of nickel on cast iron, the nickel industry has not only brought out a number of uses for alloyed iron, but also has promoted research which has stimulated better foundry practice and higher physical properties of ordinary gray iron. Significant of the progress made in this line is the increase in the average tensile strength of unalloyed iron from 15,000 pounds per square inch about 20 years ago to 30,000 pounds today, with many foundries regularly supplying alloyed cast irons having strength values in excess of 60,000 pounds per square inch.

The advances and increasing popularity of thermal treatment for cast iron have added to the market for nickel in this field, because nickel alloyed cast irons are more frequently heat treated than unalloyed irons. Better wearing qualities obtained by heat treatment are being utilized in many installations, notably those for railroad and automotive parts such as cylinder liners and gears.

S S S

Parts for Street Signs Are Protected with Cadmium

Cadmium plating is used as the protective coating on steel parts of street signs being erected in Kansas City, Mo. Specifically, the parts plated are steel tie rods and nuts which hold the ornaments and signs in place. The signs are of brilliant hue — yellow lettering on a black background. The ornaments are of aluminum. Cadmium was selected as the coating for steel parts by the director of public works as being the most efficient for the prevention of rust and staining of aluminum and sign. About 5400 of the signs are being made.

S S S

Pole Line Hardware Free From Brittleness

In connection with its investigation of embrittlement of hot-galvanized structural steel, the American Society for Testing Materials appointed a subcommittee to collect data on the procedure for detecting injurious embrittlement of cold-worked steel plates and bars and their products, commonly called hardware. A survey was made among the various producers and users of this type of material, commonly known as pole line hardware, and the experience gathered from the questionnaire seems to show that very little trouble is being experienced from injurious embrittlement.

Provided open-hearth steel is used, and proper annealing or stress relieving operations are carried out as proposed in the report on the embrittlement investigation, the possibility of injurious embrittlement is remote. The fabricator should satisfy himself as to the quality of the steel and the manufacturing processes to insure good results in the finished product. If proper care is taken in the selection of steel and in manufacture, this should give assurance of comparative freedom from embrittlement.

No simple means for the detection

New Escalators Installed

ELECTRIC STAIRWAYS: Steps are carried by chains mounted on massive sprocket wheels which are connected positively through a large steel torque tube on which is mounted the drum of an electrically operated emergency brake which springs into action should the main driving chain fail. Other units include a driving engine and motor, a service brake, a centrifugal governor to prevent overspeed, a contact which prevents reversal of travel, stop switches on the lower sprocket shaft to stop the stairway should either step chain break or stretch beyond certain limits, etc. The visible portion of the installation is of aluminum with alumilite finish, micarta and rubber. Built by Westinghouse Elevator Co., Chicago, and serving the Marshall Field store, that city, from sub-basement to ninth floor, these stairways have carried as many as 4105 passengers in an hour

of embrittlement has been developed by the users of this type of material other than testing to destruction. The present tendency among manufacturers appears to be to extend the process of working the steel hot into somewhat smaller shapes and sizes than those covered by the recommended practice of the committee. In general, there has been a rather limited amount of trouble from embrittlement in pole line hardware; and that which has been encountered may all be traced to the use of improper steel or improper manufacturing processes.

S S S

Develops Composition for Pearlitic Cast Iron

Pearlitic structure cast iron can be obtained from a composition containing 0.01 to 5.0 per cent nickel, 0.01 to 2.0 per cent molybdenum, 1.75 to 3.75 per cent carbon, 0.5 to 3.0 per cent silicon, and 0.25 to 2.0 per cent manganese if superheated over 2550 degrees Fahr. before pouring, according to a recent patent. The mixture also may contain from 0.10 to 2.0 per cent chromium. The iron is said to possess great strength, moderate brinell hardness, uniform structure, resistance to wear and abrasion, and stability of structure at elevated temperature. It also can be heat treated to obtain specific properties.

S S S

Ship Hulls of Alloy Steel

The use of nickel alloy steel hull plates for the welded construction of large liners is being tried by certain of the Old World shipbuilders. Although this application is still in an experimental stage, it is being watched with as much interest as was given only a few years ago to the early development of cupro-nickel condenser tubes.

S S S

Pyrometer Controls Motor

A photoelectric pyrometer is used to control the motor which drives a centrifugal pipe casting machine in a pipe foundry near Philadelphia. After the hot metal is poured into the rotating mold, the pyrometer checks the metal and as it is cooled to a predetermined point the motor is shut down.

Tests Show Constant Time Is Chief Factor in Spot Welding Work

BY WARREN C. HUTCHINS
Industrial Engineering Department, General Electric Co., Schenectady, N. Y.

DETERMINING by test the most suitable type of timer for various spot welding applications is an expensive procedure which only the largest users can afford to undertake. Furthermore, those who have designed and built timing equipment for sale *should* have the following history back of the timer to prove its value to users:

1. Theories which led to the development of the timing device.
2. Equipment built to perform, as nearly as possible, in accordance with the theories.
3. Conclusive tests to prove or disprove the value of the equipment when applied to production machinery.

The General Electric Co. was confronted with this problem in the selection of a timer which would be best suited for welding ordinary cabinet steel, stainless steel, monel, everdur and many other metals, aggregating a total of more than 2,500,000 spot welds each week. The company uses several hundred welders and it was therefore logical that tests should be conducted to determine the variables in resistance welding. After the variables were determined, a control could be selected or designed best to control the power supply to the welder.

Probably the most interesting of all facts learned in these tests was that when the welder adjustment remained unchanged, the current demanded by the welding machine under the following sets of conditions did not vary appreciably:

1. With two thicknesses of metal between the electrodes.
2. With four thicknesses of metal between the electrodes.
3. With metal of a different thickness between the electrodes (no weld made).
4. With no metal between the electrodes (no weld made).

Tests were carried out on a standard cam-operated, press-type spot welder with a throat depth of approximately 24 inches. An oscillograph was used to measure the current and voltage.

The results obtained might appear surprising, but after considering the constants of the welding circuit and the power factor, the reasons are obvious.

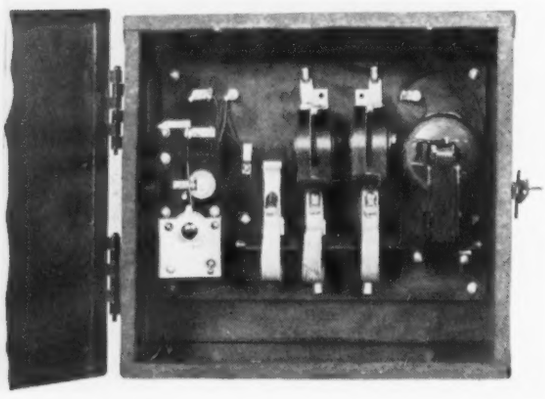
Reactance Is Not Changed

Current supplied to the welder was at a power factor of 0.28. This shows that the voltage drop in the circuit which was in phase with the voltage, or in other words a result of resistance and other losses in the circuit, was only 28 per cent of the total. The remainder was restricted by the reactance of the welding circuit. Further, the resistance of the parts being welded was only part of the total resistance in the welding circuit.

Therefore, when the number of laminations between the electrodes was changed, or when the work was entirely removed from the welder, only a change in total resistance took place and no change in reactance. The result was a slight shift in power factor with practically no change in current.

It was thus proved that for spot welding this class of material, it was useless to change the time on the basis of a change in current caused by different number of sheets of metal or different thicknesses of metal between the electrodes, *because there was no appreciable change in current.*

Other tests were conducted to determine the results of welding steel with mill scale, rust and other foreign matter on it which would cause an appreciable change in the total re-



SPOT welding control panel in which a small synchronous motor closes and opens a set of contacts which in turn control the operation of the main welding contactor

LIGHT *crates for* **HEAVY** *loads*

Tin mill type of pickling crate constructed entirely of rolled Monel Metal by YOUNGSTOWN WELDING & ENGINEERING CO., Youngstown, Ohio. These crates, designed for individual capacity of 3,500 lbs. cold rolled steel plate, weigh approximately 1,365 lbs. each. They are used in 3 to 5% solution of sulphuric acid at 185° F.

112 Spacer Bars no problem in this tin mill pickling crate . . . it's ROLLED MONEL METAL

● Look at the crate shown above. Slender as these bars may be, don't think that acid will soon eat them up.

Remember, *this* crate is built of rolled Monel Metal.

Strength and chemical stability

It's not necessary to make a pickling crate so heavy that each load is practically all crate and no product! Make it of rolled Monel Metal.

Monel Metal resists corrosion so stubbornly that there's no need to build in excessive thickness for the pickling bath to eat away.

Neither is excessive thickness needed to carry heavy loads. Light bars of this steel-strong high Nickel alloy are more than adequate.

Furthermore, Monel Metal's resistance to corrosion is about your surest guarantee that the bath will clean your product thoroughly.

Thorough Cleaning — No Plating

The cleaning action is not impeded, either chemically or electrolytically, by Monel Metal. The crate won't plate your product.

Monel's resistance to hot sulphuric and cold muriatic acids, *plus* great strength are well known to Youngstown Welding & Engineering Company, which specializes in pickling equipment. Performance records lead that company to urge rolled Monel Metal for all its important installations.

The tin mill type of crate shown above is a "Youngstown" product . . . one of a battery of four recently built for Follansbee Brothers Company, of Follansbee, West Va.

Let us tell you about some of the interesting case-histories of Monel's performance . . . both in pickling crates and tank tie-rods . . . under the severest pickling room conditions. Just drop us a line.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed by International Nickel.

INCO MONEL METAL

MONEL METAL

NRA

sistance. It was found that the current did change slightly, but where the resistance was higher than average, the heat in the weld was greater than under average conditions. Therefore, if any change was made in welding time, this change should be a decrease.

If a control was used, however, which would pass current for a shorter time when the current was low (resistance of the work being high because of oil, scale, etc.) the control would also shorten the time when the current was low as a result of a dip in line voltage or of an extremely high contact resistance between the electrodes and the work. Obviously, this would produce faulty welds.

Thyratron Duplicates Time

These tests proved that to minimize the effects of all of the variables encountered in spot welding, the control should be capable of *accurate duplication of the time* during which power is supplied for making each weld.

On more than 70 of its several hundred welders, General Electric now uses thyratron controls, which give duplication of time to the exact same number of complete cycles of the power supply; and all other welders are equipped with some less expensive constant-time control.

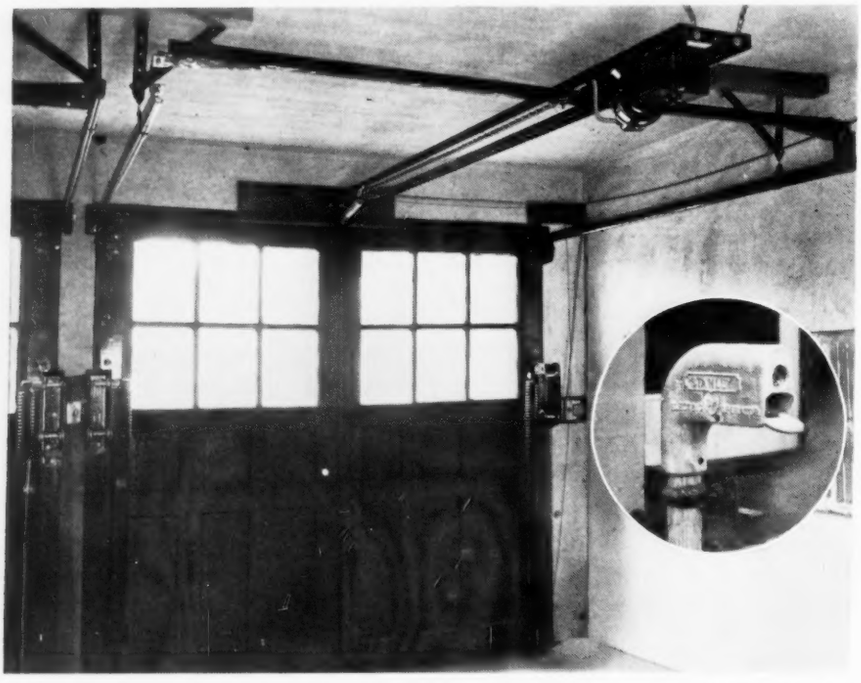
One of the most satisfactory timers, shown in the illustration on Page 52, is one using a small synchronous motor to close and open a set of contacts which in turn control operation of the main welding contactor. The time is consistently duplicated within approximately ½ cycle of the power supply. This timer has been applied to welders requiring currents up to 1000 amperes, by adding a large main contactor. It is inexpensive and therefore is justified for use even with the smallest bench welders such as are used in the manufacture of vacuum tube parts.

Steel Garage Door Operator Adds to Motorists' Comfort

Many garages are being equipped with a steel door operating device which enables the driver to open the garage door without leaving the comfort of his car and walking through rain and snow.

Two illustrations below show such a device manufactured by the Stanley Works, New Britain, Conn. The frame is of 1½-inch steel angles. The motor is mounted on a base of 3/16-inch steel plate bolted to the steel angle frame. It operates a sprocket through a V-belt and worm and gear and the sprocket operates a steel roller chain to which is attached the door arm. This chain is provided with two special links, one at each end of travel. Just before the door reaches the full open or closed position, the link strikes a steel trip which causes the door to come into position gently. Roll-up door hardware, such as track, hinges, cams, brackets, handles, cross braces, steel springs, carriage bolts, screws, etc., all are of steel.

The device is operated from a post switch, shown in the inset, located within 20 feet of the garage door. The post unit is fitted with a lever switch and cylinder lock mounted in a heavy iron casting on a 1-inch galvanized steel pipe standard.



This operating mechanism enables motorist to open garage doors without leaving comfort of his car. Post switch, operated from car window, is shown in inset

Cutting Alloy Now In Production

ALLOY 548, first announced in STEEL for Jan. 23, 1933, is now being manufactured under the trade name Premet by the Ludlum Steel Co., Watervliet, N. Y., under license of the Carboloy Co. Inc., Detroit.

An improved cutting material, with properties and price in the range between high-speed steel and the cemented carbides, the alloy was developed during the course of an extensive investigation of iron-tungsten alloys by W. P. Sykes, metallurgist, Cleveland Wire Works, General Electric Co., Cleveland. Cobalt was substituted for part of the iron, resulting in a series of alloys exhibiting promising cutting characteristics. Further work indicated that small additions of molybdenum and vanadium improved these materials and a preferred analysis was first obtained in heat No. 548, this number then being applied to the alloy.

Analysis of Premet is approximately: Cobalt, 30 per cent; tungsten, 20 per cent; molybdenum, 3 per cent; vanadium, 2 per cent; and carbon, 0.12 per cent.

Electric Furnace Product

It is said to resemble super high speed steel in that it can be melted by the usual tool steel methods in an electric furnace and cast into ingots. The ingots can be subsequently forged and rolled to the desired shape. After forging and rolling, the bars can be machine straightened without difficulty, indicating an extremely tough "as rolled" condition. After rolling or forging, the alloy is in a condition termed "annealed" and can be machined. The hardness is about 45 C Rockwell but machining is not as difficult as the hardness would indicate. The first step in heat treating consists of heating to 2230-2280 degrees Fahr. and cooling in mica. After this treatment the hardness is 45 C to 50 C Rockwell and additional machining may be performed if desired. The high temperature treatment is said to bring out the best cutting qualities. At this point the tool may be finish ground or not, depending on the wishes of the user. The second and final heat treatment consists in heating to 975 degrees Fahr. and cooling in mica. This increases the hardness to about 66 C Rockwell.

The fact that a tool may be com-

pletely finished before applying the second treatment is of importance in the manufacture of form tools. The heat treatment of Premet also lends itself to partial hardening. For example, a milling cutter might be mounted on an arbor and rotated in a salt bath in such a manner that only the teeth would be heated to 975 degrees Fahr. This would produce a hard cutting edge and at the same time provide a very tough section at the base of the teeth. With slight variations from the treatment outlined above, a hardness of 70 C Rockwell can be developed. This compares with a maximum of 67 C for high speed and cobalt high speed steels. The heat treatment of Premet is no more sensitive than is required for ordinary high speed steel. This new alloy is said to possess marked red hardness properties and does not lose its cutting hardness after reheating to as high as 1380 degrees Fahr.

Intermediate Material

Physical characteristics, it is stated, indicate that it has a place in the so-called "gap" between cobalt high speed and tungsten carbide and at a price comparable to stellite.

The new alloy is said to have been found successful in machining materials and operating under the following conditions: Heat treated and cast ferrous materials brinelling 300 to 450; austenitic high manganese and chrome-nickel steels such as KA 2; finishing cuts on soft and medium hard steels at high cutting speeds of 150 feet; ordinary steels brinelling approximately 200, operated at cutting speeds 25 per cent over high speed steel; nonferrous metals such as brass, monel, aluminum, etc.; malleable iron; reaming cast iron.

Noninflammable Lubricant Solves Oil-Fire Problem

Separation of the lubricating and operating fluid systems offers a practical solution of the oil-fire problem, according to designers of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. In this arrangement, oil continues to be used for the lubricating system, but a noninflammable fluid is used for operating the throttle and governor valves. This noninflammable fluid, known as aroclor, is manufactured by the Swann Chemical Co., Birmingham, Ala. It is an organic compound of diphenyl and chlorine, and has given satisfactory service as an operating fluid on steam turbines. Dow Chemical Co., Midland, Mich., also is a manufacturer of a similar product.

In addition to separating the lubricating and operating systems, the fire risk on steam turbines operating with high steam temperatures can be reduced materially by careful attention to details of design and by rigid maintenance. Good housekeeping is of the utmost importance. Careful inspection should be made of flanged joints and valve packing to avoid leakage of oil which may strike hot surfaces. Oil puddles or oily surfaces immediately should be mopped up and the leak repaired.

The oil system should be carefully studied from a design standpoint. The oil-fire hazard can be reduced by the use of seamless steel piping of ample thickness, elimination of flanged joints wherever possible, use of steel in preference to cast iron or brass for valves and fittings, supporting pipes in such a way as to minimize stresses in piping and flanges, reducing sizes of oil reservoirs and housing them in a separate totally enclosed fireproof room, covering hot steam pipes adjacent to oil pipes with a sheet metal jacket to direct any oil spray away from the hot parts, and taking other precautions of a similar nature.

These design features have been incorporated in the oiling system for the 165,000-kilowatt tandem unit now under construction at the Westinghouse Electric & Mfg. Co.'s plant at South Philadelphia, Pa.

French Ship To Use Window Frames of Stainless Steel

Stainless steel window frames for the winter garden of the new French flagship NORMANDIE, now under construction at St. Nazaire, France, have been fabricated by the Edward G. Budd Mfg. Co., Philadelphia, and were shipped to France recently. The winter garden will be located on the forward deck of the liner; hence the window frames had to be built to withstand the attacks of heavy winter seas and at the same time had to be light enough not to interfere with visibility. Stainless steel meets these requirements ideally. The garden will extend entirely across the ship, 116 feet, will be 108 feet deep and 22 feet high. Both sides and front will be glass enclosed.

New Sheet Steel Tops for Renovating School Desks

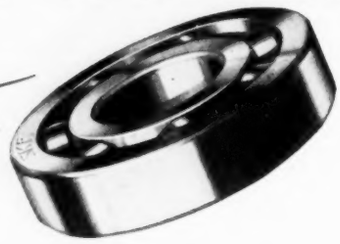
A steel top for school desks has been developed by the Stow Mfg. Co. Inc., Binghamton, N. Y. After schoolboys have whittled their initials all over the old wooden tops, one of the new steel tops can be slid over the wooden top like an envelop, whereupon the desk is provided with a new top that is whittle proof.

Formed in presses at the Stow plant from 0.031-inch cold rolled body sheets, says D. Walker Wear, president of that company, the tops may be supplied with a baked enamel or baked lacquer enamel finish. For sound absorbing purposes a layer of insulating material is placed between the steel and the wood. The tops are fastened in place by two screws underneath the desk top. Where inkwell holes are required the company furnishes an adjustable cutter which can be used in a brace or hand breast drill.

Of interest is the price schedule on these tops. In the unfinished state they are quoted at $20 a dozen, f.o.b. Binghamton, less 1 per cent for cash in 10 days. Finished in standard school brown, the price is $24 per dozen. Quantity discounts range up to 25 per cent on lots of more than 10 dozen.

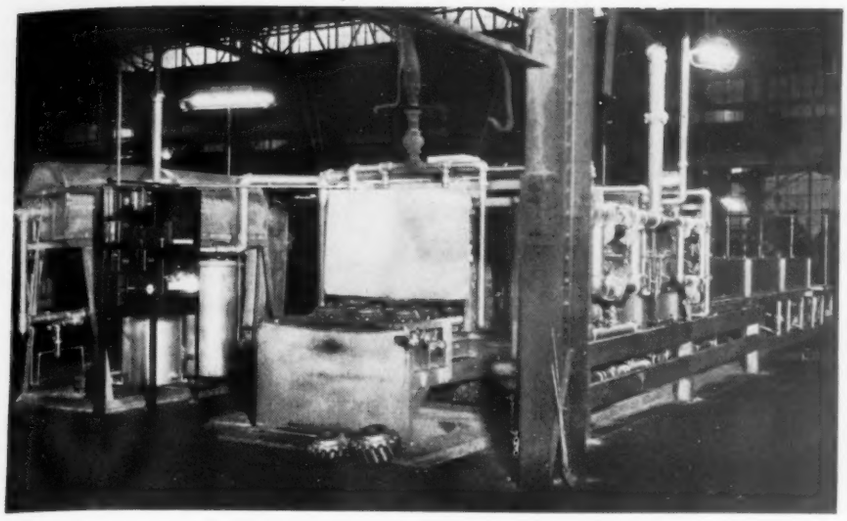
Steel tops make old desks look like new and are whittle proof

AWARD *for* PERFORMANCE



TRIED and true bearings, those that have been selected for the world's newest and greatest liner of the air. Tried on the Spirit of St. Louis . . . the Columbia . . . the America . . . the Question Mark . . . the Macon . . . the Graf Zeppelin. And so news that the great Martin Clipper Ship was to be SKF-equipped was welcomed not as just another order for bearings, but in view of SKF's record along the skyways, as another significant "Award for Performance". SKF Industries, Inc., Front Street and Erie Avenue, Philadelphia, Pa.

SKF
BALL AND ROLLER BEARINGS
STEEL



Full-muffle, controlled-atmosphere, continuous walking-beam furnace which clean anneals automobile wheel stampings between draws. The scale-free surface of the stampings eliminates a pickling operation. The furnace is heated with butane gas and has a capacity of 2160 pounds of steel per hour

Stampings Annealed Scale Free in Continuous Furnace

BY A. G. SEGER
Plant Engineer, Motor Wheel Corp.

RECENT trends in the design of parts made from steel stampings are toward drawing the metal to greater depths than in former practice. The increased severity of the drawing operation, therfore, requires that considerable attention must be given not only to the mechanical side of production control but to the metallurgical side as well.

Such has been the situation with the production of certain steel stampings used in the manufacture of automobile wheels in the plant of the Motor Wheel Corp., Lansing, Mich. A typical wheel stamping is shown in an accompanying illustration. Considerable cold working is required in the forming of these stampings and therefore annealing became essential in order to reduce the hardness of the steel before proceeding to the next operation. It was desired to conduct this annealing operation in such a manner that not only would the work hardening strain be relieved but also that the work would be clean, smooth, and scale-free. Such a surface condition, of course, would improve the general appearance of the stamping, would eliminate the pickling operation, and at the same time would increase the life of the drawing die.

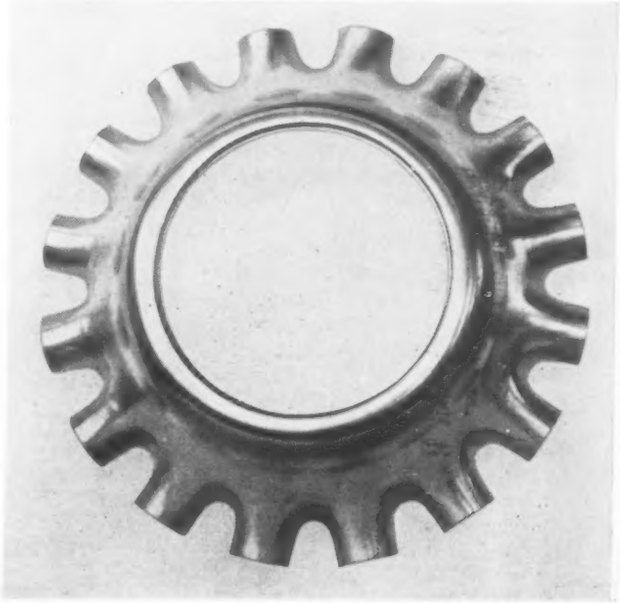
Annealing practice up to this time was to use standard open-fired batch furnaces with subsequent pickling, but to perform this operation more economically and conveniently, the company decided to install a continuous furnace which would require less floor space and which could be placed into straight-line production. Therefore, a full-muffle type, controlled atmosphere furnace with a rated capacity of 2160 pounds of clean annealed steel stampings per hour was purchased. This furnace has now been in operation for more than a year.

The furnace is unique and represents a radical departure from conventional design. The mechanism for conveying the work through the full muffle is of the walking-beam type which eliminates the necessity for heating any tare weight or parasite load. Such would not be the case if trays, pans or belts were used to convey the work through the furnace. Furthermore, the walking-beam type construction afforded considerable advantage in the cooling zone because of the elimination of tare weight which also would have to be cooled. Such a construction, it is believed, had not been attempted up to that time and the successful and economical operation of this furnace unquestionably represents a noteworthy advance in the progress of furnace design for the heat treatment of metal.

Heating and Cooling Zones

This furnace, built by the Surface Combustion Corp., Toledo, O., and shown in an accompanying illustration, has an internal width from wall to wall of 4 feet 8 inches, and a total heating length of 15½ feet. At the end of the heating zone is placed a cooling zone which is approximately 25 feet in length. In this zone, heat is abstracted from the work by means of water-cooled walls, so that the stampings are reduced to a temperature of approximately 400 to 500 degrees Fahr. before being brought out into the plant atmosphere. During its entire travel through the

(Please turn to Page 73)



STEEL stampings for automobile wheels undergo a considerable amount of cold work, therefore must be annealed between draws to reduce their hardness. This illustration shows a typical wheel stamping

LARGE USES OF STEEL IN SMALL WAYS

281st Article ◆ Portable Platform Scales

THE practice of weighing dates back to the earliest days of civilization. Modern scale equipment is of relatively brief history, tracing its ancestry back about 100 years to when Thaddeus Fairbanks devised a method for improving the crude balancing system employed by early settlers of New England. At that time the weighing mechanism used was an adaptation of the old Roman steelyard, consisting simply of a balance arm that carried the load on the short arm and the weights on a platform suspended from the long end.

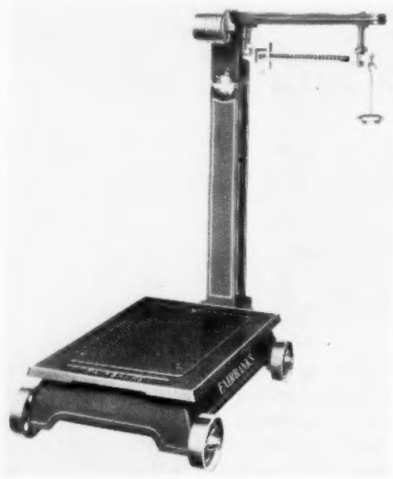
The platform scale devised by Thaddeus Fairbanks in 1830 marked a revolution in scale design and became the forerunner of equipment which today is in universal use for weighing various types of commodities and merchandise. This invention for the first time made it possible to locate the loading platform level with the ground instead of suspended in the air. A crude system of levers connected the platform to the steelyard.

4000 Different Designs Now

Development of different types of scales has been rapid during the past 100 years and today equipment is available for determining the weights ranging from hundreds of tons down to the smallest appreciable values. The list of various types of scales now available, including different sizes of each, numbers more than 4000. Probably the most popular scale from the standpoint of use in the industrial and merchandising fields is the portable platform type. Employed for many years by factories, grain stores, freight houses and miscellaneous wholesale and retail establishments, it finds wide use in weighing up to 1000 pounds.

Portable platform scales generally are made in capacities of 500 or 1000 pounds. A modern design, such as that illustrated, is of all-metal construction—principally iron and steel. Formerly the pillar, cap and platform were of wood but because of severe service and atmospheric conditions to which this equipment sometimes is subjected, steel has been found a more suitable material and has been generally used since about 1926.

The scale shown uses copper-bearing steel sheets for the pillar and cap as well as for the center panel of the platform. The pillar and cap are stamped, formed and welded to shape. Other rolled steel parts include the steelyard, a steel rod which is located inside the pillar and connects the lever system with the beam. Pivot and bearing, seen to the left of the beam, are of hardened tool steel. Stainless steel has been adopted for pivots and bearings on some other types of scales. Die cast aluminum is used for the beam. Remaining parts are principally of cast iron, those including the base or frame and the lever system. The latter transmits the weight on the platform base to the steelyard and beam.



—Courtesy Fairbanks, Morse & Co., Chicago

Modern platform scales are of all-metal construction, principally iron and steel. Copper-bearing steel sheets are used for the pillar and cap, as well as for the center panel of the platform

Around 150 pounds of iron and steel is required in the manufacture of this type of scale, annual production of which numbers several thousand. As indicated, the larger portion of this weight is made up of cast iron. The tendency in scale design in general, however, has been toward the greater use of rolled steel parts, this being illustrated in latest models of baby and health scales. Health scales of the upright type are somewhat similar in appearance to the portable platform scale. While several thousand of this variety of health scale are sold annually, the less expensive bathroom scale is the most popular for home use. Annual production of the latter type, described in STEEL, May 29, 1930, is in the hundreds of thousands.

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Use of Prefinished Sheets Lowers Assembly Costs

(*Concluded from Page* 49)

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Another recent application for prefinished sheets is the air conditioning cabinet, Fig. 1. Sheets making up this unit are formed and the edges flanged. In assembly the sections are bolted or cold riveted. Welding of the prefinished material is not yet practicable.

The veneer coating, in a process patented by the Di-Noc Mfg. Co., Cleveland, for example, is placed on the sheets in flat form. When this is completed the sheets can be put through any of the various forming and drawing operations. The finish is not marred by the dies. Users of this material point out that the coating will withstand without fracture or distortion any forming operation to which the sheet itself may be subjected successfully.

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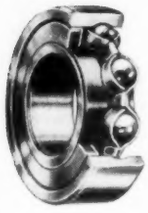
Double Row Radial

Duplex

Single Row Radial

Grease Shield D Type



Felt-Seal T Type

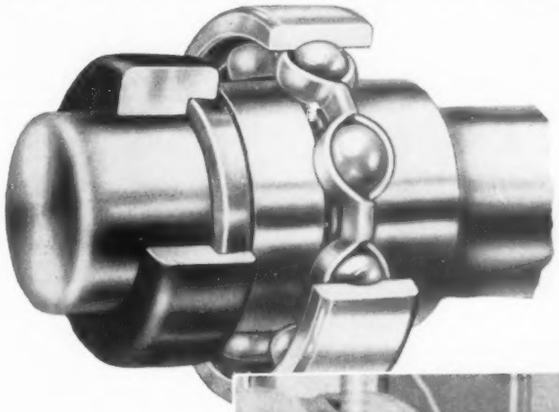
Self Aligning S Type

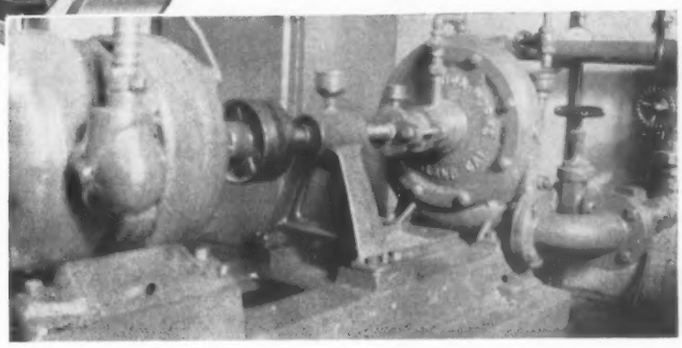
Self Aligning L Type

Thrust

The RIGHT Fafnir Here meant NON-STOP service

SINCE '22





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FAFNIR BALL BEARINGS

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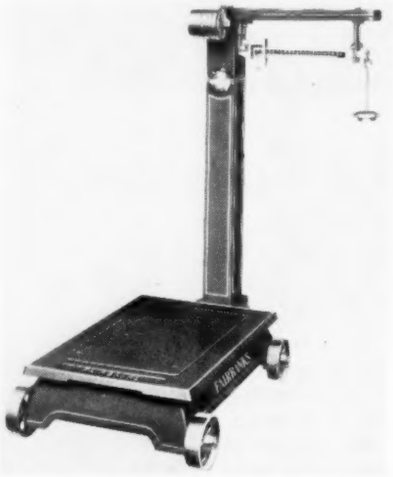

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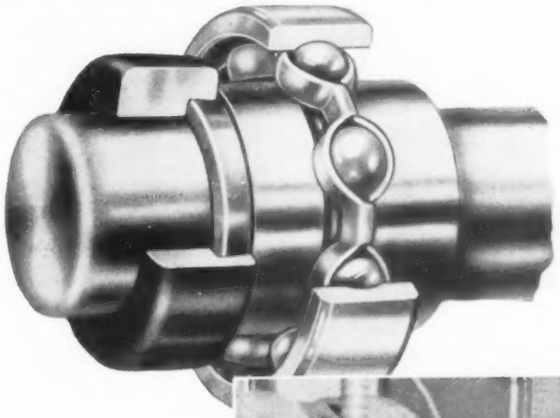
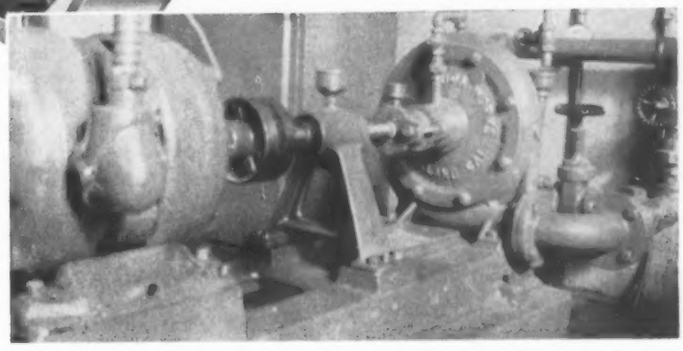
SINCE '22





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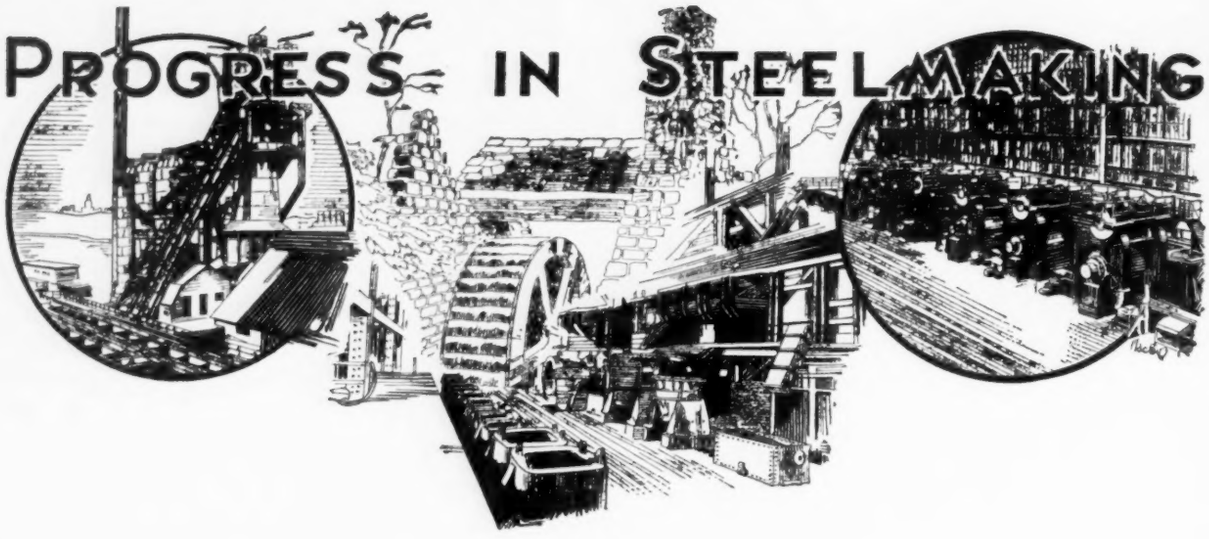


Oxygen Always Available

Installation of a welded oxygen line at an Ohio steelworks has been found to be advantageous. Ample supply of oxygen always is available to open the tap hole. There is no danger of exhausting the oxygen cylinder at the critical moment and losing the analysis by not getting the heat of steel out of the furnace at the proper time. The latter frequently happens when single oxygen cylinders are used. Cylinder handling on the floor also is eliminated.

• • •

Removes Foreign Material

Oil, grease, smut, pigments, abrasives and other insoluble dirt can be removed readily from all types of steel mill machinery by a recently marketed soluble. The liquid makes all oils and greases easily rinsible with water. Recent tests credit the product with a cleaning cost of 2 to 4 cents per 1000 square feet. Larger savings are claimed where wiping, brushing or scouring operations are involved.

• • •

Aids in Cold Drawing Wire

Best results are obtained in drawing cold heading wire by using a lubricant made of high-grade English soap, 25 per cent dry lime and 50 per cent aluminum stearate. The lime should be between the heavy and medium grade.

• • •

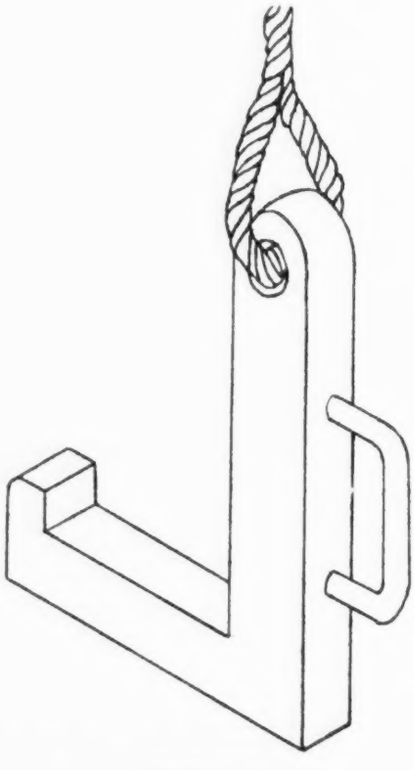
Insulation Curbs Losses

With blast furnace blowpipes of bare iron heated to a visible red heat and with the bustle pipe at a temperature of 1550 degrees Fahr., the hot blast temperature between the rear and front end of the blowpipe, will show a drop of 83 degrees. With the blowpipe insulated, however, the decrease in temperature from one end of the blowpipe to the other is only 10 degrees Fahr., according to recent tests.

• • •

Hook Provides Safe Grip

MOVING RAILROAD CARS WITH A CRANE: This may not be the best practice from the standpoint of safety, yet in many cases it can hardly be avoided. Where shop practice calls for the movement of a car a hook shown in the sketch below can be used with safety, according to A. D. Berquist, safety inspector, Youngstown Sheet & Tube Co., S. Chicago, Ill. The device is attached to the under part of the car sill and will not slip off or damage the car



Utilizes Steel Plate Scrap

Ingot mold caps made of scrap steel plates now are being used by a steelmaker in Pennsylvania. The plates are cut to shape with an oxy-acetylene torch and a handle, also gas cut from scrap plate, is welded on the cap. The steel plate caps, which are unbreakable, cost about 1 cent a pound and have effected a savings of 2 cents a pound compared to former practice.

• • •

Galvanized Inside and Out

Hot dip galvanizing is employed to coat both the exterior and interior of a newly marketed conduit as well as the threads. A nonsoluble raceway for the wiring is provided by covering the zinc coating on the inside with a coat of a linseed-oil base, elastic black enamel. As an added protection the outside coating is painted with an acidproof enamel.

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New Brick Has Wide Usage

The greatest and most important steps that refractory brick makers have made in many years has been the recently introduction of the lightweight semirefractory brick. This insulating brick, which has found wide application, affords operating conditions to be attained in the minimum of time. The furnace is easy to halt and holds at a given temperature such as is required in annealing furnaces for such work as large rolling mill rolls. The new semirefractory material assists in speeding up furnaces in production lines and has been instrumental in changing many continuous furnaces into the more or less periodic type.

owing to the ease of operating such equipment for daily working conditions.

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Discloses Processing Data

Effect of processing on the properties of strip steel is disclosed by tests recently conducted in Germany. Samples of basic open-hearth strip of 0.09 per cent carbon and basic bessemer strip of 0.05 per cent carbon were cold rolled. The test pieces then either were annealed at the temperature ranging from 1200 to 1480 degrees Fahr. or normalized at 1740 degrees Fahr. and finally given a skin pass. The drawing qualities of both were approximately the same. The normalized strip had a higher strength but a lower ductility and gave fewer repeated bends. A 35 per cent cold reduction followed by an anneal results in the best drawability. The tests disclosed that stretcher strains disappear after skin rolling 1 per cent but return after three weeks of aging; after skin rolling 3 per cent the stretcher strains did not return after several months of aging.

MOST OF US often wonder what this or that steel plant is doing in the way of improving its practice. There was a time when we did more visiting but lately conditions keep us close to our work.

We can make these visits by proxy, however, for every week, on this page, STEEL takes you in many plants and gives you the opportunity of securing profitable ideas in a fraction of the time it would take you to secure them yourself.

If you desire further information on any idea, announcement, lead or suggestion presented, please write us. Perhaps you know of an idea or "shop wrinkle" that has effected a reduction in operating costs at your plant. If so, won't you send it along?

The Editors

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Socket Protects Rope Wires

In excess of 90 per cent of the ultimate strength of wire rope is developed by a wedge socket which avoids damaging the pulling end of the rope. The bearing surfaces of the socket and wedge are machined to protect the rope wires where the stresses are the greatest. The units are particularly adapted to crane service in steel work, blast furnace hoists, yard cranes and steam shovels.

Thicker Plastic Lining, with Fillet Joints, Lasts Longer In Pickling Tanks

TWO changes in the method of applying its patented plastic lining to the interiors of pickling tanks were introduced about two years ago by the Ceilcote Co., Cleveland. As a result of observations up to date, these changes have been adopted as standard practice by this company. Present indications are that the life of the lining applied in the improved way has been doubled.

One of the first applications of this new method was on a battery of 12 pickling tanks located in a single pit at an Ohio steelworks. This battery is devoted to the pickling of stainless steel sheets and carries a boiling solution of hydrochloric, nitric, sulphuric and hydrofluoric acids. The tanks are not of uniform construction, some being of wood and others of steel, brick or concrete. These tanks were lined uniformly with a single ¼-inch layer of Ceilcote plastic compound. Some of them, after two years of continuous service, began to leak in the joints.

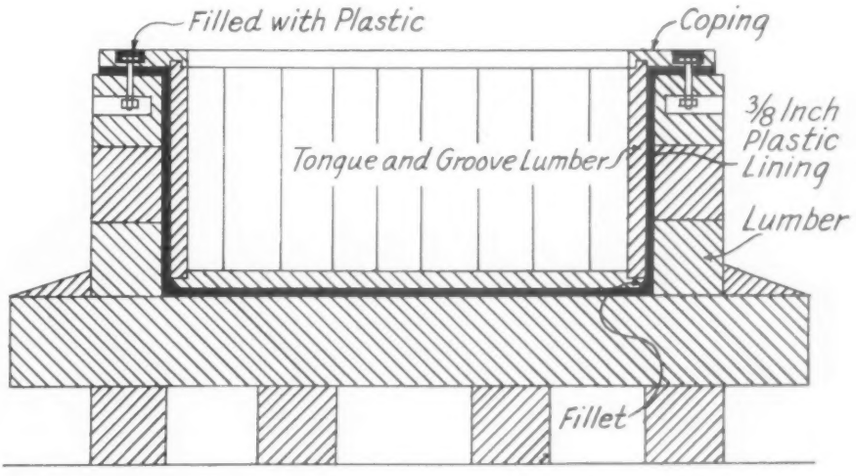
The new method of applying the lining was developed at that time for the purpose of increasing the life of the lining. In lining wood and steel tanks, a ⅛-inch layer of the compound first was troweled thoroughly against the tank, afterwards followed with the second layer of ¼-inch, troweled tightly against the first layer, making a total thickness of ⅜-inch. In addition the edges were reinforced with additional material in the form of fillets ¼-inch thick. Concrete and brick tanks were given the same treatment, excepting that the lining was put on up to ¾-inch.

Experience has shown that the lining laid up in this manner is sufficiently elastic to resist the repeated stresses of continual expansion and contraction at the joints. Tanks lined in this manner two years ago are expected, from their present condition, to be good for an additional service life of at least two or three years before relining becomes necessary. The same method has been applied, altogether, to more than 500 tanks, in various steel producing and fabricating plants.

Suitable for Heavy Operation

In addition to tanks in which contraction and expansion are unusually severe in view of the high temperatures of the pickling solution, the new method of lining also is proving beneficial in heavy pickling operations. In some cases where the lifts are as high as 30,000 pounds, the linings occasionally were damaged despite the use of protective sheaths over the lining. It is found that the heavier, fillet-reinforced lining has trebled the life in these heavy-duty tanks.

A change has been made in the method of applying the wood sheathing which serves to protect the face of the lining. It now is the practice to use no nails but to employ tongue and groove lumber which locks into a coping bolted to the top of the tank walls. The wood used is the long leaf yellow pine which is standard in pickling tank construction. In some of the heavy-duty tanks such sheathing is as thick as 3 inches. In addition to wood, brick or stone sheaths, laid up in Ceilcote, are recommended where desired.



Cross section of a wood pickling tank, provided with ⅜-inch plastic lining with reinforcing fillets at corner joints. The lining of this particular tank, 5 x 40 feet in size, and 6 feet deep, is protected by long leaf yellow pine, tongue and groove sheath which locks into the top coping

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ROEBLING WELDING WIRE

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Symposium Deals with Metals Used in Petroleum Industry

FROM drilling to refining, the petroleum industry has long challenged steelmakers to meet unusual requirements for equipment and materials to combat numerous corrosive factors, severe pressures, high temperatures and many varied service conditions unique in oil refining and distribution. Few industries have influenced the development of steel alloys more. This known fact was emphasized in the symposium which the American Institute of Mining and Metallurgical Engineers conducted last week on the use of metals in the petroleum industry.

Replacement of refinery equipment must be justified economically and installation of material, probably more costly, which may outlast the remainder of plant equipment, yet have no recovery value, should be avoided. Thus to the oil refinery engineer the extent and type of alloys entering into plant equipment is one of great importance.

Extensive tests as to advantages of numerous alloy steels have been made at the Baytown, Tex., plant, Humble Oil & Refining Co., results of which were outlined by J. E. Pollock of that refinery. Specimen alloy strips were used and results obtained over an investigating period of several years. Specimen exposures were made on glass covered rods on racks, the alloys being spaced by glass spacers. Time was allowed to obtain weighable differences of the metals, or sufficiently short to prevent complete metal loss. Two steels and a cast iron were employed, 12 specimens of each, with examinations made at monthly intervals up to 12 months or more to record variation as to corrosion and other changes.

Test Chrome-Nickel Series

Broad general conclusions indicate corrosion in fresh water and steam are comparatively mild and high chromium-nickel steels highly noncorrosive in locations selected. Steam caused only slight corrosion, indicating steam valve troubles are due to erosion rather than corrosion.

High chrome-nickel alloys are especially resistant to corrosion in all services surveyed. These, with but one instance, contain 25 per cent or more of chromium with nickel ranging from 9 to 58 per cent. The 18-8 group of alloy steels also has high resistance. These alloys had low carbon content and the general effect of higher carbon steel alloys in weakening resistance to corrosion was apparent. Knowledge of the carbon content in the 18-8 steel alloy therefore is important when purchasing material for corrosion resistance. High and medium chromium alloys are less resistant than those combined with a balanced nickel content, the effect being rather proportional to the chromium.

Although showing high resistance to corrosion, high chromium-nickel alloys and high chromium steels are not considered suitable for universal economic adoption, according to Mr. Pollock. Price factor, allowed for some alloys, justifies use of others for small manufactured articles, such as valve trim. The 12-14 per cent chromium steel is not particularly resistant to liquid on a debutanizer plate, lasting but 16 months in one instance. Considerably longer service was obtained with alloy cast iron, although copper-nickel alloys were considered.

Measure Resistance to Acids

Comparative failure of medium-chromium steels resulted in exposure to 5 per cent hydrochloric acid. Copper-nickel alloys stood up better, but high copper, low zinc alloys are definitely resistant to acidic conditions. Alloy cast irons have a decided advantage over plain cast iron, although silicon iron is above the average. In caustic soda solutions none of the metals tested at the Baytown plant showed high losses. The copper alloys, copper-nickel, copper-zinc and copper-tin are rather highly resistant in weak acid, sulphurous and sulphuric, or wash water from acid treating. The same resistance is shown to water containing hydrochloric acid separated from naphtha in the distillation of crude oil. Chromium-nickel and chromium steels, however, while resisting corrosion of wash water do not have the same resistance to water separated from naphtha. Short-lived in these refinery practices are plain steel, cast iron and wrought iron.

STEEL and alloy requirements for oil refinery equipment tax producers of parts to meet exacting specifications, especially alloy steel foundries. Forged and rolled material is widely accepted by oil plant engineers for many refinery needs and foundries generally have overcome their problems in connection with such uses. A great improvement in low-carbon alloy steel castings has resulted. The development of such a large number of alloys, however, has led to some confusion, and refinery operating departments urge fewer alloys to meet pump needs, particularly from the cost point of view.

The subject of the use of metals in the petroleum industry was discussed in much detail at a two-session symposium held in New York on Feb. 21 in connection with the annual meeting of the American Institute of Mining and Metallurgical Engineers. On the accompanying pages STEEL *presents a partial report of this important symposium; the concluding portion of the report will appear next week.*

AMONG the highly alloyed cast irons, the austenitic type, containing 14 per cent nickel, 6 copper and 2 to 3 chromium, is finding wide application for refinery equipment parts, including pump and valve bodies and trim in pipe line equipment where resistance to corrosion is important, according to A. G. Zima, development and research department, International Nickel Co., New York. A modification of this material with a tensile strength range from 60,000 to 100,000 pounds per square inch is being developed for pipe line flanges and bolts subject to severe corrosion. Alloy cast irons also are used extensively for working barrels and plungers for oil well pumps.

A slush pump equipped with alloy cast iron for pistons, cylinder liners and valve plate covers has castings of 1.25 to 1.75 per cent nickel and 0.30 to 0.40 chromium. These are readily machined and have a tensile strength of 45,000 pounds or more, being uniform in density and hardness throughout heaviest sections. Deeper wells have brought about more scientific methods in drilling and more exacting specifications for drilling tools. Modern rotary drilling tools must stand tremendous abrasion and high impacts. Bits, core drills and reamers have been developed to meet more stringent use. Bodies are usually cast steel or forged alloy steels, heat treated for strength and toughness. Cutters are often machined from low carbon nickel steel forgings and subsequently case hardened, according to Mr. Zima.

Service Records Examined

Reliable alloy steels have contributed much to the full hole tool joint in drilling, such joints being mostly machined forgings and oil quenched and tempered to brinell hardness of 310-330 for strength. Failures in joints often may be traced to lack of precaution in operation rather than to the material or joint. Low alloy, high strength iron castings for pumps, compressors, valves, oil and gas engines, are readily machinable;

the same applies to heat-treated centrifugally cast alloy irons for cylinder liners in slush pumps and diesel engines.

"Wire line" drilling is a late development, especially applicable to deep wells. The bit assembly is lowered through the drill pipe by a wire line. When reaching the head, the blades automaticaliy open out and are locked in position. When dull, the assembly is removed by an overhead shot attached to the wire line and a new sharp set of blades attached. Wire line drilling saves time in changing bits without removing the drill pipe and head from the hole.

Increased use of lower carbon steel alloys is apparent in sucker rods for drilling, according to A. B. Wescott, Gulf Refining Co. The nickel-steel alloys notably are gaining favor. While a large number of steels and alloys are now considered for sucker rods, Dr. Wescott thought that four materials, carefully selected by test and experience would meet requirements. Subject to corrosion factors in numerous oil fields, notably in Kansas and West Texas, together with high working stresses, the subject is worthy of more study. As a result of experiments, nickel-iron alloy rods reveal greater resistance to embrittlement while a nickel iron alloy rod with some molybdenum gave the largest index value at 30,000 pounds per square inch. Due, however, to greatly varying conditions, it is difficult to estimate an index of value for any material.

ROLLED and forged alloy steels, obtainable for a wide variety of uses are thoroughly reliable and their use justifiable on economic grounds, according to A. E. Harnsberger Pure Oil Co., Chicago, who discussed materials employed in oil refinery pumps. The alloy steel foundry, through research and experience, has also generally worked out problems to meet demands of the refinery pump designer. Such research with alloys, covering more than 10 years, has stimulated efforts to produce better low-carbon castings. The average foundry product, as a result, shows a marked improvement over former standards, according to Mr. Harnsberger, who said in part:

"It should be remembered that, because of the greater number of operations required in the production of alloy castings, the time required for delivery, as compared with low-carbon castings, is necessarily longer. Since the use of alloys in refinery pumps is a matter of economics, and since volume and production has a great effect on costs, it is important that future requirements be held to as few different alloys as possible, so as to enable the casting manufacturer to secure as high a volume as possible of a single alloy and avoid a large number of smaller melts. Pump manufacturers should survey the entire chemical industry and determine whether the bulk of the conditions cannot be met by a few alloys that can be produced in larger quantities at lower cost. As costs lower, a still broader field of application will be found in the less corrosive services."

Producing Satisfactory Castings

Steel foundry practice and problems as involved in the production of alloy castings were discussed by the speaker and included general observations: In general, the high-chromium and high chrome-nickel steels have poorer castability than carbon steel. Relative castability and behavior when pouring depends upon their composition, but design of the casting, thickness of metal sections, uniformity of the adjoining sections, have an important influence on the foundry's efforts to produce satisfactory and reliable castings.

Although the 5 per cent chromium steels containing small percentages of molybdenum or tungsten are not usually classified with high-chromium and high chrome-nickel steels, they perform service as distinguished from plain carbon steels in oil and steam service. The foundryman regards them as "tender"; hard to handle in the mold and have to be treated respectfully in the cleaning and finishing shop. They have a greater tendency to crack in the mold than the 13 per cent chromium steels. The 5 per cent chromium alloy is air-hardening, and as such receives, as a rule, more extensive heat treatments. The 13 per cent chromium alloy is less tender than the 5 per cent chromium alloy, has a narrower range of fluidity and must be more carefully watched to obviate porosity in the castings. This condition is particularly pronounced when the carbon content is low.

Nickel is the most common alloying element used in conjunction with chromium. The most common of the chrome-nickel alloys is the 18 per cent chomium 8 per cent nickel composition, which has better castability than any of the straight chrome or other chromium-nickel alloy steels customarily used in pump manufacture. It has excellent fluidity, but slight tendency to crack in the molds, and good welding properties.

The behavior of chrome and chrome-nickel castings, as compared to carbon castings, is noticeable in the cleaning room. Heads, gates and risers are readily removed from carbon castings with the oxyacetylene flame or cold saw. Alloy-steel castings in general are practically uncuttable by this method. A localized heat produced by the electric arc, which actually melts off the gates and risers instead of burning them off, may often result in cracking the castings. As the section to be cut off increases in size, the problem becomes more serious. Preliminary heat treatments dictated by the varying compositions are employed to obviate the danger of castings cracking during the removal of heads and gates or by welding operations in making repairs.

Casting Design and Size

"The limitations in size of casting and kind of alloy steel to be used for pump parts depend upon the design of the individual casting, the composition of alloy desired, and the equipment in the individual foundry producing the castings," said Mr. Harnsberger.

"The minimum size impeller that is practical to cast depends on the design, relation of heavy and thin sections, type of alloy used, and the ratio of the width of water passage to the diameter of the impeller. It can be roughly said that the minimum thickness of metal section is approximately ¼-inch for impellers of 12-inch diameter; and ⅜-inch for impellers of 20-inch diameter. The minimum practical width of oil passage is approximately ¼-inch for impellers up to 7-inches in diameter, and must be increased proportionately as the diameter of the impeller increases."

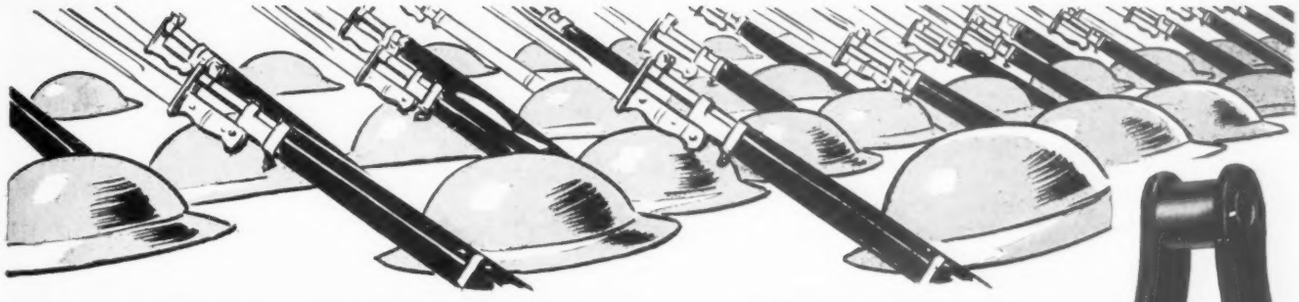
In his paper, Mr. Harnsberger presented a detailed listing of steels, alloys and metals utilized in oil refinery pump parts. This listing is given on this page and page 66.

Specifies Steels, Alloys and Metals For Parts of Oil Refinery Pumps

THE following detailed listing of steels, alloys and metals used in oil refinery pump parts constitutes a portion of a paper which A. E. Harnsberger, Pure Oil Co., Chicago, presented on Feb. 21 at the "Use of Metals in the Petroleum Industry" symposium of the American Institute of Mining and Metallurgical Engineers. This list and Mr. Harnsberger's comments on the applications of these metals should be of considerable interest to producers, fabricators and users of highly specialized metals.

Reciprocating Pumps—Cold Service

Fluid ends—Cast iron or semisteel up to 700 pounds pressure; cast or forged



HARD·TOUGH *and* STRONG

STEEL MILL CHAINS THAT WEAR LONGER

REX Transfer and Cooling Rack Chains

Rex Chabelco Chains retain their accuracy of pitch and maintain the attachments in proper alignment even under unusually severe operation on transfer and cooling racks. Here again, careful manufacture and the unit link principle make Rex Chabelco Chains wear much longer.

REX Catching and Feeding Table Chains

Rex Catching and Feeding Table Chains are made in both alloy steel and Z-Metal. Rex Alloy steel chain No. 587 (shown at the right), commonly used for this service, is an all-steel roller chain which operates on 88 sprockets. This chain maintains its accuracy due to the unit link principle by which the carefully machined parts of this chain are assembled. It stands the wear of running at relatively high speeds with reversals in direction of from 30 to 40 times per minute. Rex Z-Metal Chains are also used for this work.

To secure maximum wear with these chains on catching and feeding tables, we recommend Rex Alloy Temperim Sprockets with anti-backlash teeth.

Chain Belt Company also makes a complete line of other standard sprocket chains for every type of use —as well as a line of special chains. Write on the types that interest you.

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steel should be used for higher pressure.

Liners—Cast iron mostly, some prefering Meehanite and Ni-Resist, the latter for corrosive sour oils.

Fluid piston packing—Multiple iron snap rings.

Valves and valve seats—Light-weight stainless or composition valve on iron or nickel-iron seat recommended.

Fluid end piston rods—Carburized S. A. E. 1020 and heat-treated S. A. E. 3140 or 6150. If exposed to weather, 13 per cent chromium steel rod hardened to 300 brinell.

Centrifugal Pumps—Cold Service

Casings—Cast iron or semisteel up to 500 pounds pressure; 500 to 1000 pounds, close-grained cast iron with 1 per cent nickel. Higher pressures, cast or forged steel.

Impellers—Cast iron general suitable. Extremely sour oils, 4 to 6 per cent chromium steel alloy.

Casing wearing-rings—Many materially satisfactory. Hardened nickel steel will wear longer. If corrosion is encountered, 4 to 6 per cent hardened chromium steel alloy.

Shaft sleeves—Case-hardened, cyanide-hardened or nitrided steel where little corrosion. A 4 to 6 per cent chromium alloy with 0.5 per cent molybdenum, hardened to 250 brinell, for corrosion is satisfactory. Mechanical condition of shaft important in selection as to wear.

Rotary Pumps

Casings—Cast iron predominantly used.

Shafts and rotors—Hardened steel for wear. Hardened 4 to 6 per cent or 13 per cent chromium steels on corrosive services.

Reciprocating Reflex Pumps Handling Light Oil Fractions

Fluid ends—Cast iron or semisteel.

Liners—Cast iron largely used. Hardened chrome-nickel iron gives better service.

Fluid piston packing—Rock-hard, sectional bakelite and cast iron rings.

Valves and valve seats—Bakelite disk valves and brass, iron or nickel-iron seats with stainless or bronze seats show good service. Other combinations satisfactory.

Fluid end piston rods—Worn rods built up with stainless steel by metal spray process have shown 3 to 6 months' service; ordinary cold-rolled steel rods 1 to 3 months. Porcelain-coated mild steel average 3 to 6 months. KA2S recommended for most severe conditions. Best material debatable for ordinary functions.

Centrifugal Reflex Pumps Handling Light Oil Fractions

Casings—Cast iron or semisteel. For severe corrosion, bronze of 75 per cent copper, 15 per cent lead, and 10 per cent tin.

Impellers—Cast iron and semisteel, 1 to 2 years' service. Various bronze compositions for corrosion. Monel and Ni-Resist used successfully.

Casing wearing-rings—Many materials have been tried, including bronze. Successful use of nickel-molybdenum case hardened steel reported. Corrosion on pumps of this type is complex and service trial as to material is suggested.

Shaft sleeves—Ideal material doubtful. Where corrosion is not severe hardened or nitrided steel used. Acid-resisting bronze meets corrosion problem, but is subject to wear. Stellited sleeves have good corrosion and wear resistance, but frequently fail due to surface coating cracking or chipping. Porcelain-coated sleeves being tried. Alloys of higher chromium content of doubtful value as they cannot be heat-treated to satisfactory hardness.

Reciprocating Hot-Oil Pumps

Liquid ends—Cast iron, semisteel, cast steel and forged steel, depending on temperature and pressure, forged steel being best for the highest temperatures and pressures. Chromium content more than 6 per cent not necessary where corrosion factor enters, although alloy steel is recommended for such conditions. For corrosion resistance, heat treatment is as important as chromium content to produce uniform structure.

Liners—Close-grained cast iron gives fair service in absence of excessive abrasion and corrosion. When latter conditions exist, various alloys used, including nickel-chromium-molybdenum iron, centrifugally cast and hardened to 500 brinell. Other alloys show good results. For temperatures above 600 degrees Fahr., highly alloyed nickel cast iron good.

Fluid piston rings—Cast iron generally used, but better service may be secured from a hardened material, such as chromium-nickel iron.

Piston rods or plungers—Material should not be brittle because of shocks. For handling moderately corrosive oil, S. A. E. 1025, carburized and hardened to 450 brinell; cast carbon steel of 300 brinell; chromium-nickel-molybdenum-vanadium steels of 350-400 brinell; Nitralloy with nitriding period of 96 hours; S. A. E. 6150 heat-treated to 300 brinell; U. M. A. 5 having 375 brinell; low-carbon steel rods metallized with high-carbon steel. When corrosion is experienced despite cooling system, 12-13 per cent chromium having hardness of 300 brinell. Wear generally more important than corrosion influence.

Valves and valve seats—Cast iron for low pressures and temperatures, cast steel for high. If oil tends to deposit much carbon or is moderately corrosive, forged or cast 13 per cent chromium steel valves with brinell of 300 and 350 for seats.

Centrifugal Hot-Oil Pumps

Outer casings—Cast iron, semisteel, cast steel and forged steel. Good castings properly annealed equal forgings as shocks are eliminated. If oil is corrosive, 4 to 6 per cent chromium alloy with 0.5 per cent molybdenum satisfactory.

Inner casings—Cast 4 to 6 per cent chromium alloy preferred. Resists corrosion and accumulates coke much slower than plain carbon steel, although heat-treated low-carbon cast steel is used.

Case stud bolts—Because of large joints, material important. Under severe conditions: Chromium, 5 to 6 per cent; tungsten, 0.75 to 1.25; carbon, 0.25 to 0.35; silicon, 0.5 maximum; manganese, 0.5 maximum; sulphur, 0.05 maximum; phosphorus, 0.05, maximum. Heat-treatment should produce: Tensile strength, 140,000 pounds per square inch; yield point, 126,000 pounds; elongation in 2 inches, 17 per cent; reduction in area, 45 per cent; brinell hardness, 270 to 300.

Impellers—Semisteel and low carbon steel for noncorrosive oils up to 900 degrees Fahr. Chromium steel up to 11 to 13 per cent widely used under corrosive conditions. General practice is to fit chromium-steel impellers with wearing rings faced with stellite No. 1 on wearing surface which is carefully heat-treated and inspected for surface cracks.

Casing wearing rings—Forged 11 to 13 per cent chromium alloy steel hardened to 300 brinell. For corrosion 25 per cent chromium and 12 per cent nickel alloy.

Interstage bushings—A stellited 4 to 6 per cent chromium-molybdenum steel; also 11 to 13 per cent chromium steel hardened to 300 brinell. For but slight corrosion, low-carbon steel with stellited surface.

Shaft sleeves—Stellited low-carbon steel where corrosion is not severe. Under severe conditions, 25 per cent chromium, 12 per cent nickel sleeves. Chromium plating reported unsatisfactory.

Balancing disks and breakdown drums—Stellited surfaces largely used on bar stock 4 to 6 or 11 to 13 per cent chromium steel alloy. Chromium-vanadium-manganese steel also used as facing is extremely resistant to erosion, but expensive.

Reciprocating Absorption Plant Pumps Handling Light Fractions

Fluid ends—Cast iron, semisteel and low-carbon. Close-grained cast iron with 1 per cent nickel for higher pressures.

Liners—Cast iron most often used. Ni-Resist, however, more than doubles service life of cast iron.

Valves and valve seats—Bakelite disk valves on iron seats give good service. In time cast iron collects foreign material requiring cleaning. Wing-guided valves of 4 to 6 or 11 to 13 per cent chromium will improve this condition.

Piston packing—Cast iron rings generally used, although three-piece bakelite rings operating on iron liners are an improvement.

Piston rods—A 13 per cent chromium steel alloy hardened to 300 brinell satisfactory.

Centrifugal Absorption Plant Pumps

Casings—Cast iron, semisteel and low-carbon steel for low or close-grained cast iron with 1 per cent nickel alloyed for high pressures.

Impellers—Cast iron or semisteel. If oil is moderately corrosive, Ni-Resist good and may be fitted with 13 per cent chromium stellited wearing rings.

Casing wearing rings—Case-hardened steel of nickel-iron if conditions are not corrosive, but if so, a 13 per cent chromium alloy is satisfactory.

Shaft sleeves—If conditions are noncorrosive, case-hardened steel shaft sleeves; 11 to 13 per cent chromium alloy, heat-treated to 300 brinell for corrosion. Latter may be stellited on wearing surface to increase wear.

Sludge Acid Pumps

Definite recommendations in the case of acid pumps is difficult to make in view of the fact conditions as regards temperatures, pressures, acid concentration and abrasion vary over a wide range. Usually the best combination of materials can be arrived at only after considerable experimentation.

Centrifugal Acid Pumps

Duriron is satisfactory if connections are such as to avoid strains on the material. Acid-resisting bronze gives fair service on all parts. Monel is equal or superior to bronze.

Reciprocating Acid Pumps

Fluid ends—Acid-resisting bronze or red brass.

Liners—Acid-resisting bronze or a bronze made to A. S. T. M. specification B-60 or monel metal is used. Acid-resisting bronze of 85 per cent copper, 10 per cent tin, 5 per cent lead recommended.

Pistons and piston rings—Meehanite, acid-resisting bronze and monel.

Rods—Tobin bronze or monel; latter is superior.

Valves and valve seats—Acid-resisting bronze or monel.

Rotary Acid Pumps

Acid-resisting bronze cases and shafts and rotors either of acid-resisting bronze or of monel generally used.

Observations on Slack Wind Blast Furnace Operation

BY FRANCIS M. RICH, Superintendent Blast Furnaces
Republic Steel Corp., Youngstown, O.

Part I

PRIOR to the start of the world-wide depression, the primary purpose of most blast furnace operators was to produce a maximum tonnage of pig iron per day for each furnace in blast. Some attention was paid to the conservation of labor and raw materials, but the idea was well established that low cost pig iron was attainable only when each furnace was producing a high tonnage.

After the depression had set in, the picture changed considerably. Each blast furnace operator was forced to run his plant in a manner that best fitted the economical setup of his company. A great deal of thought was expended on the different methods of operation, always with the idea of making each product in a way that would best serve his company financially. Because of this abnormal condition, the blast furnaceman was compelled to indulge in various practices, many of which were believed to be next to impossible up to that time. The ultimate purpose of these innovations was either one or a combination of the following:

1—To produce only enough pig iron for immediate consumption at a minimum cost.
2—To produce gas for boiler or mill use to supplant some higher priced fuel.
3—To consume the coke produced at the coke plant, which was often viewed as a by-product.
4—To protect the cash position of the company.

These conditions were met by diverse methods such as:

1—Slow or decreased wind, where in some cases the blast blown was held as low as 25 per cent of the normal volume.
2—Intermittent operation, when the furnaces were shut down or "fanned" at frequent intervals.
3—Slow wind for a week or so and then normal wind for a short period. Each substantial change of wind often was accompanied by a change of burden, to produce a different grade of iron.

In spite of these methods, the operators were required, more than ever before, to produce iron of excellent quality to meet the keen competition of other companies and the rigid specifications of customers.

Slow wind operation has done more toward perfecting blast furnace technique than any other development. Most furnacemen have found that lowering the wind on their furnaces meant a decrease in fuel consumption and flue dust losses, in spite of the fact that there were many "sick" furnaces before the fundamentals of success for slow blowing were appreciated. An inspection of these fundamentals reveals nothing new to the blast furnaceman, but operators are convinced that an infraction of these rules is accompanied by far more serious results on slow wind than on normal wind. These principles, which have been proved many times in practice, are as follows:

1—The furnace lining must be in fairly good shape. The brickwork should not be cut out or built up excessively and the furnace must be operated in such a manner that the walls are kept clean at all times. The lining should be plumb, the ideal condition being that the traces of all horizontal plants with the inwall shall be perfect circles, the loci of whose centers shall form a straight vertical line, which is the true center line of the furnace.
2—The top-charging mechanism must be correctly designed, located and operated. The vertical center lines of both bells and their respective hoppers should be colinear with the true center line of the furnace in all positions. Both bells and their hoppers must be kept clean at all times. The distributor must be working correctly, and the entire charging equipment operating so that equal portions of each raw material are deposited in all sectors of the same size in the furnace.
3—The correct filling must be used. By this is meant that there are always a few methods of filling, with regard to the sequence and quantity of each raw material charged, that give the best results on the furnace under the operating conditions at the time.
4—Each raw material should be as nearly uniform in chemical analysis and physical properties as possible. Also each material should be weighed and measured correctly at all times according to the schedule determined by the operators.
5—Enough slag volume should be carried to run the furnace on a lean or glassy slag, if the raw materials and the sulphur content limits of the product will permit. Some plants also are limited in this matter because the slag is used for commercial purposes and must meet the tests of customers successfully. It is the general opinion that more slag volume is required as the wind is decreased.
6—The blast distribution must be uniform in temperature and quantity at each tuyere or at least at each pair of adjacent tuyeres.
7—The correct size of tuyeres must be used in order to meet the operating conditions.

The best way to keep an accurate check on a furnace lining is to install thermocouples in the lining, preferably at the start of the campaign. The hot junctions should be about 12 inches from the original inwall and the cold junctions connected to a multiple point recorder. This has proved satisfactory in several plants. Another method is to determine the heat absorbed from the cooling water while passing through the plates located above the mantle. The plates should be blown out before testing so that there will be no dirt left which would tend to insulate the copper.

How Lining Is Tested

If there is doubt in the operator's mind whether the furnace is cut out on the hot side or built up on the cold portion, test holes can be easily drilled to check the lining. If the lining is badly cut on one side, the true center of the furnace is moved in that direction. The practice on the furnace will be improved if the charging apparatus be moved so that its center coincides with the new center of the lining. A great deal of checking should be done to determine the cause of the excessive wear, otherwise, if allowed to continue, a hot spot is apt to develop which may necessitate blowing out the furnace and patching the lining.

If the lining is built up, which is more apt to happen on slow wind, the usual remedy is to upset the filling in an attempt to clean off the "scabs". One furnace man in the Chicago district in relating his experience, mentioned that his particular furnace had been working poorly for several months. The coke consumption and flue dust losses were high, indicating that his furnace was badly "scabbed up". Several holes drilled in the inwall proved this to be true. A strong odor of potassium cyanide was detected at the holes. The method of filling immediately was reversed, that is, charging coke on the bell first with the ore on top of it. This was done for several

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HEREWITH is presented the first installment of a paper presented Feb. 18 before the American Institute of Mining and Metallurgical Engineers in New York. On that occasion the Institute presented to Mr. Rich the J. E. Johnson Jr. award in recognition of outstanding work in advancing progress in the operation of blast furnaces.

Table I

Effect of Various Cleaners

Day of month	Theoretical coke rate, lbs./g. t. pig	Burden, lbs./charge	Average CO_2 in top gas—%	Remarks
19	1957	20,000	12.7	Charged 40,000 pounds of mill cinder.
20	1892	20,600	12.6	Charged 41,200 pounds of Bessemer slag.
22	1847	21,200	14.0	Charged 20,000 pounds of siliceous ore every 8 hours and continued
23	1750	22,400	14.2	.....
25	1702	23,000	14.3	.....

hours each day, the amount being increased on each succeeding day. In about four days the furnace "cleaned off", and made several high-sulphur casts of iron, after which it straightened out and ever since has been one of the outstanding furnaces in the country on slow wind.

The use of "cleaners" is a subject on which many furnacemen disagree. Some prefer to "slug" the furnace with charges of siliceous material, such as mill cinder, brick bats, bessemer slag, or high-silica ore. We had one particularly successful experience with this type of cleaner. Furnace "C" had been operating on 27,000 cubic feet of wind per minute, and was not carrying the normal burden. The significant figures on this experience are presented in Table I.

The first "slug" as shown in this table was charged on the 19th day of the month. About 14 hours later the furnace got "sloppy" at the tuyeres. This condition maintained for several days, and gradually diminished. The furnace came up "hot" or high in silicon as soon as the sloppy condition started, and burden was added at once to bring the silicon down. In six days time, enough burden had been added to cut the theoretical coke rate down 255 pounds per gross ton pig. This theoretical coke rate is close to the actual coke rate and is used because it is an excellent index of the furnace operation at the time. Because of this experience we prefer to "slug" the furnaces at regular intervals when the wind is brought down around 30,000 cubic feet per minute.

The maintenance of a clean big bell is not nearly the problem it formerly was, since the advent of the steeper angles of 50 degrees and over. Trouble is still experienced at times due to the material baking on the surface of the metal. One operator installed sprays in the gas seal which kept the surface of the bell cool and thus prevented this baking condition of the ore. On slow wind most operators insist on keeping the bell empty until the furnace has reached a level where a charge can be put in at once. This is done because of the comparatively long period of time between charges. Some operators charge so that the Mesabi ores, which are usually of a sandy nature, are first on the bell, and the more plastic Old Range ores, which are often high in alumina, are charged on top. Others use reverse filling or occasional charges of scrap to produce a scouring action on the bell surface. Constant inspection must be made in order to insure against this evil, because a dirty bell means trouble.

Method of Filling Varies

The selection of the best filling is an age-old problem which generally is solved by trial and error. Every furnaceman has his own method which has been formulated from experience. The bureau of mines has done some excellent work on this subject in its investigations[1].

The thermochemical reasoning so thoroughly covered by the bureau of mines paper, "Stock Distribution and Gas-Solid Contact in the Blast Furnace is as follows."

The work done in the upper shaft consists of (1) drying and preheating the charge, (2) first steps of reduction, (3) calcining the limestone. All of these reactions require a supply of heat. Therefore, the more uniform the contact between the gas and solid phases, the more effective will be the heat transfer and the sooner will the work be accomplished—within certain definite limits.

The advantage of doing as much work as possible in the upper part of the furnace is not apparent until the secondary reactions are considered. The secondary reaction that has the most bearing on the process is that of "Solution Loss," represented by the equation

$$CO_2 + C = 2\ CO \qquad (1)$$

This reaction does not occur at an appreciable rate below 850 degrees Cent., but every time it does occur, it means that solid carbon has been lost to the process unless the resulting CO is reconverted to CO_2, either through reduction or carbon deposition (reverse of equation 1) further up the shaft. However, none of the solid carbon entering the gas stream through the medium of solution loss is ever completely recovered in the upper part of the furnace, so a distinct loss of efficiency is involved if any reaction producing CO_2 is allowed to occur at elevations in the furnace where the temperature exceeds 1000 degrees Cent.

The ideal condition is to complete the reduction of iron ore and calcining of limestone in the upper part of the shaft at temperatures below 1000 degrees Cent., allowing no production of CO_2 at temperatures higher than this. The more intimate the gas-solid contact in the upper part of the furnace, the more nearly will conditions approach those in the ideal furnace advocated by Gruner.[2] Commercial operation never attains this ideal. Furnace investigations show that 20 to 80 per cent of the reduction is carried on below the top of the bosh, in the hotter part of the furnace.

So-called direct reduction—that is, reduction by hot carbon rather than CO gas—is another factor to be considered. It is debatable whether direct reduction occurs according to the equation,

$$FeO + C = Fe + CO \qquad (2)$$

or is a combination of the reactions,

$$FeO + CO = Fe + CO_2 \qquad (3)$$

and

$$CO_2 + C = 2\ CO \qquad (1)$$

The mechanism of the reaction, however, is a point only of academic interest, as the over-all effect is the same in both cases; that is, carbon is taken from the coke to produce CO, whereas the work could be done just as well with less carbon by producing CO_2 at lower temperatures. If reduction is completed at low temperatures, no iron ore is left to be reduced at high temperatures and consequently there are no secondary reactions that tend to diminish hearth temperatures. Hearth temperatures, necessary to complete desulphurization and reduction of silica, place definite limitations on fuel requirements. To maintain hearth temperatures, as much of the coke as possible should be burned at the tuyeres.

In other words, when some of the work of the upper shaft is performed by the heat of the hearth, which is available at high temperatures only, it is similar to heating a building with steam at 400 pounds pressure when steam at 2 pounds pressure would suffice.

It follows that in order for the upper portion of the stack to perform in the ideal manner, the gas-solid contact of the furnace must be perfect. This would mean that each par-

(*Please turn to Page 73*)

[1]Kinney, S. P., Royster, P. H., and Joseph, T. L., Iron Blast Furnace Reactions: Tech. paper 391, bureau of mines, 1927.

Kinney, S. P., The Blast Furnace Stock Column: Tech. paper 442, bureau of mines, 1929. Composition of Materials from Various Elevations in an Iron Blast Furnace: Tech. paper 397, bureau of mines, 1926. Effect of Sized Ore on Economy of Blast Furnace Operation as Based on Results of a 500-Ton Furnace: Tech. paper 459, bureau of mines, 1930.

Furnas, C. C., and Joseph, T. L., Stock Distribution and Gas-Solid Contact in the Blast Furnace: Tech. paper 476, bureau of mines, 1930 and others.

[2]Gruner, M. L., Blast Furnace Phenomena: Translation by L. D. B. Gordon, Henry Carey Baird Co., Philadelphia, 1874, p. 28. Johnson, J. E. Jr., Principles, Operation and Products of the Blast Furnace: New York, 1918 pp. 1, 75, 95. Richards, J. W., Metallurgical Calculations: New York, 1918, p. 274.

NEW EQUIPMENT

Tap Chaser Rake Grinding Attachment—

Landis Machine Co. Inc., Tap Division, Waynesboro, Pa., has placed on the market a fixture or attachment, shown herewith, for use in regrinding or sharpening the chasers employed in Landis style LT and style LM receding chaser collapsible taps. Correct grinding or sharpening of collapsible tap chasers is vital to efficient performance of these tools. It is always important that the rake angle be ground suitably for the material being tapped as different rake angles are required for the different materials.

The attachment is composed of three main parts; first, a base adapted for fastening to the table of most makes of tool and cutter grinding machines. Attached to the base is a second part, the swivel bracket, adjustable in a horizontal plane in relation to the base. The bottom part of the swivel bracket is graduated to permit obtaining the desired degree of azimuth, which is the angle at which the chaser is set from the parallel. The third part of the attachment is the vise base clamped to the swivel bracket and which holds the chaser while being ground. The vise base can be rotated in the vertical plane and securely clamped at any angle as determined by graduations on the top of the swivel bracket. This permits setting the chaser at the proper elevation for grinding the gun tap in the throat section of the rake.

The vise base is provided with a milled flat which will accommodate all sizes of tap chasers. The chaser is held in place by an adjustable spring clamp and locked with a hand screw. The attachment is suitable for grinding all sizes of chasers employed in the Landis style LT collapsible taps, the style LM receding chaser collapsible taps and also those employed in the Victor collapsible and receding chaser taps formerly manufactured by the Landis company or Victor Tool Co.

Landis attachment for use in regrinding or sharpening chasers

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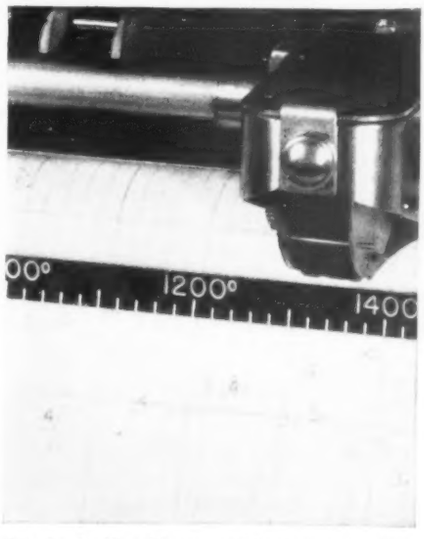
Numerals in Colors for Recorders—

Leeds & Northrup Co., 4901 Stenton avenue, Philadelphia, has introduced a new system of numerals in colors which simplifies the reading of multiple-point instrument records.



Leeds & Northrup multicolor printing device and section of chart

This new marking system, illustrated herewith, can be specified on Micromax strip-chart recorders for 2, 3, 4 or 6 points. With each of the thermocouples, resistance thermometer bulbs or other primary elements identified on the chart by a numeral, and each numeral distinguished from the others by being printed in a contrasting color, reading of records is made easy, errors are avoided and time is saved. Colors used for printing the numerals are: black, green, red, violet, yellow and blue. The print-wheel on these multiple-point recorders has a separate inking pad for each point to be recorded.

• • •

Motor Base—

American Pulley Co., Philadelphia, recently introduced a motor base which provides tension con-

American motor base provides tension control of belts

trol in exact relation to fluctuations in the load. With the base properly applied, belt tension can only slightly exceed the result of the torque action, thereby eliminating the possibility of excessive belt tension.

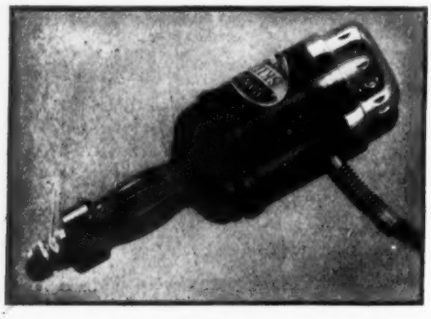
In the motor base, shown herewith, all members are made of steel. The cranks supporting the cradle and motor arms are steel forgings. These are the only moving parts and they are equipped with graphite bronze bearings, requiring no lubrication. Crank bearings are of the ball and socket type. Bases are made in eight standard sizes, and other bases built to special dimensions can be made to individual specifications. The same base is applicable to floor, wall or ceiling mounting.

• • •

Electric Hand Grinder—

Skilsaw Inc., 3310 Elston avenue, Chicago, recently introduced an electric hand grinder with bakelite body and a high-speed motor. This compact new tool, shown on page 72, is suitable for a multitude of grinding purposes in production work, repairing, die and mold making, etc. Cooling of the motor is provided by a fan which pulls an ample volume of air through the tool. A special filter which protects the

intake, is housed in a metal shell and is instantly detachable for cleaning. The molded plastic body is



Skilsaw hand grinder meets many industrial requirements

light and strong and has the advantage of being a nonconductor of heat and electricity. The grinder weighs only 2¼ pounds and can be used with a large assortment of sizes and shapes of grinding wheels.

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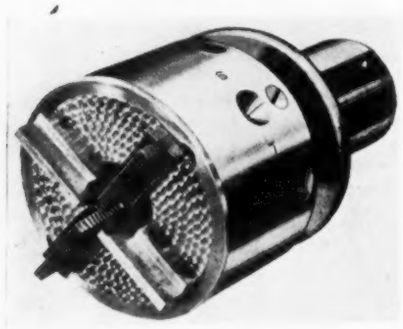
Interchange Chaser Blade and Holder—

National Acme Co., 170 East 131st street, Cleveland, recently brought out a new interchange chaser



Precision, simplicity feature National Acme chaser blade and holder

blade and holder, shown herewith, designed to meet the needs of threading jobs where changes from job to another are frequent. The blade chaser slips into a slot in the block, protruding on each end. On one end are the threads of the chaser with the ground cutting edge; on the other end is ground a heel or cam which is seated snugly in the cup and assures accurate opening action.

By building the cutting edge and the heel into one blade, correct location of cutting edge is secured, and each chaser will take the same depth of chip, which is essential for accuracy of lead. The blade is wider than the depth of the slot, making more grinds possible.

These chasers and blocks are interchangeable in the dies with the circular chasers and holding blocks of corresponding die size, in the rotating or nonrotating series. Stockable sizes available range from ¼ to 1 inch.

◆ ◆ ◆

Surface Pyrometer—

Pyrometer Instrument Co., 103 Lafayette street, New York, recently brought out a surface pyrometer intended for steel mills, etc. The new instrument, shown herewith, is of the bow type, is self contained,

Bow type surface pyrometer developed by Pyrometer Instrument Co.

rugged, quick-acting and accurate. It is scientifically designed for measuring curved or flat, stationary or moving surfaces.

Due to a patented clamping device the indicating needle will stop when high temperature is reached Therefore, contact and reading of actual temperatures no longer have to be made simultaneously. Extension handles are furnished to meet individual conditions. The new pyrometer can be obtained with various scales ranging from 30 to 1000 degrees Fahr.

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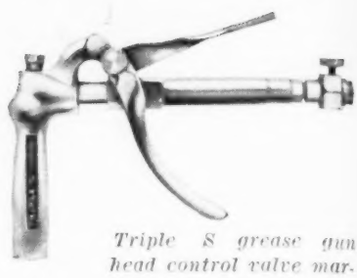
Grease Gun Head Control Valve—

Specialty Sales & Service Corp., 138 Holden street, Minneapolis, recently developed a triple S gun head control valve which operates on any grease line pressure of



Triple S grease gun head control valve marketed by Specialty Sales & Service Corp.

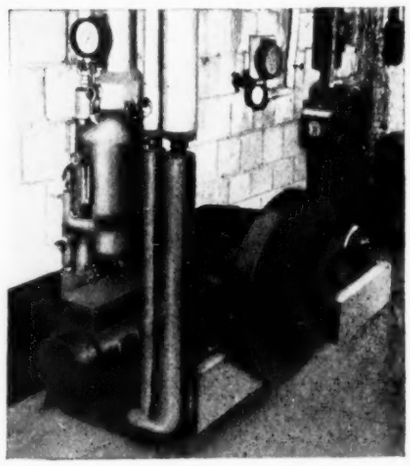
from 50 to 5000 pounds. It has been designed particularly for use on all types of pressure systems and power-operated grease guns, barrel pumps, 100-pound drum pumps, etc., and is capable of building pressure from that carried on the grease line up to and in excess of 20,000 pounds.

This lubrication procedure advocates a low line pressure of 100 to 1000 pounds, with the new gun head control valve, shown herewith, at the end of the high pressure hose, with which, by easy and rapid stages, the pressure can be stepped up to in excess of 20,000 pounds when required on badly clogged bearings.

◆ ◆ ◆

Steam Booster Compressor—

Worthington Pump & Machinery Corp., Worthington avenue, Harrison, N. J., is offering a steam booster compressor, the purpose of which is to take steam from an existing boiler system, raise its pressure beyond the capability of the boiler itself and distribute it to points of demand. This booster, shown herewith, has been developed to take care of situations where, as often happens, a supply of steam of higher pressure than can be contained from the available steam sources is required for some phase of manufacturing process, or to increase pressure in steam that has been carried through long pipe lines, etc.



Worthington steam booster compressor permits close temperature regulation

Steel Stampings Annealed Scale Free in Furnace

(*Concluded from Page 57*)

furnace, the work is completely surrounded by a special atmosphere for the purpose of preventing the formation of scale.

As previously mentioned, the work is conveyed through the furnace on a walking-beam mechanism consisting of 15 rails which are continuous from the loading platform completely through the furnace and including the discharge platform. The stampings are loaded manually, and they then progress through the furnace with an intermittent motion in response to a time-clock control. An average time interval of 22 minutes is required to carry the work from the charge end to the discharge end. This cycle, however, can be varied for other types of work by changing the time clock intervals.

Normally, the work is heated to a temperature of 1450 to 1600 degrees Fahr., after which it passes into the cooling chamber wherein its temperature is reduced to approximately 400 degrees upon being discharged. The pieces are then taken off of the conveyor and loaded onto suitable trucks to be conveyed elsewhere in the plant. No pickling or other treatment is required before proceeding to the next forming operation because the annealing has been done without the formation of scale.

Special Gas Is Used

To produce clean annealed stampings, it is necessary to employ a special gas atmosphere which is prepared in a separate unit, a DX-type gas generator, also supplied by the Surface Combustion Corp. In this unit the gas is prepared by partial combustion of butane gas and air, mixed in proper proportions and then introduced into both the heating and cooling zone of the furnace. This gas not only provides a non-scaling atmosphere within the furnace but also seals the open ends against incoming air.

Although this furnace was designed to produce clean annealed steel stampings of a definite size and weight, it has been found suitable and highly practical for annealing various other smaller parts. Such parts, which are not sufficiently large to span across the walking beam rails, are placed on pans and then passed through the furnace in the normal fashion. Although slight changes in adjustment are necessary to run these parts, no difficulty arises since the adjustments can be easily and quickly made. After the correct predetermined settings of the control and gas generator have been established, no further attention is required by the operator.

Operations of the furnace, therefore, is quite simple and flexible and labor is a very small factor. The product is very satisfactory, the pickling operation has been eliminated and the large amount of stock which would be tied up between stamping operations if the former batch methods of operation were used has been reduced.

This furnace is operated entirely on butane gas as fuel and this affords a low production cost with considerable savings over previous methods of annealing. After eight months of operation the furnace was shut down for inspection purposes. At that time the walking beam mechanism showed virtually no wear and the furnace itself needed no repairs. It can be stated, therefore, that this furnace design, incorporating a walking beam mechanism within a muffle, is proving practical from the standpoints of construction and economy, as well as the production of scale-free annealed stampings.

Observation on Slack Wind Blast Furnace Operation

(*Concluded from Page 70*)

ticle of ore in any given horizontal plane must be in the same stage of reduction and that the gas analysis, temperature and velocity will be uniform at any point on this plane as a result. Such a condition does not exist in practice, although there are a few furnaces that have shown excellent test results with correspondingly good practice.

The method of attack advocated by the bureau of mines[2] is as follows:

1—Determine by experiment the gas-flow characteristics in the upper part of the furnace.

2—Correct the gas-flow by means of changes in methods of charging.

At the time these experiments on furnace "C" were performed, we did not wish to go to the trouble and expense of drilling holes in the inwall, providing sampling tubes, etc., so it was decided to sample the gas at different points across the stock-line by means of $\frac{3}{8}$-inch pipes lowered through the try-rod holes and bent so that the points on the stockline and toward the center of the furnace could be reached. Generally two modified. Orsat sampling machines were used simultaneously, each at a different try-rod hole. The CO_2 was usually the only determination run, as the sum of the CO_2 + CO in blast furnace gas by volume is almost always in the range from 38 to 41 per cent. These try-rod holes were located at a distance of 9 inches from the stockline wall, and after some experience samples were taken only at these 9-inch distances and compared with the average top gas analysis to determine whether the gas was channelling up the walls or up the center. Many interesting results were obtained, some of which were of a beneficial nature as regards the practice on the furnace. In the period of a year, 1017 determinations of CO_2 were run, on samples taken at these 9-inch distances.

(*Continued in next week's issue*)

[2]Furnas, C. C., and Joseph, T. L., Stock Distribution and Gas-Solid Contact in the Blast Furnace: Tech. paper 476, bureau of mines, 1930, p.p. 38-39.

New Trade Publications

PLATFORMS — Barrett-Cravens Co., Chicago, in its bulletin No. 252 presents new features of value in its platforms for hand or power trucks. It is well illustrated to show details that make for sturdiness.

ELECTRIC FURNACES—Hevi Duty Electric Co., Milwaukee, has issued bulletin HD-135 on its standard line of box type furnaces, with illustrations and detailed description. A table of specifications is also given.

MOTORS—Louis Allis Co., Milwaukee, has issued several bulletins on various types of motors. No. 507 describes direct current motors; No. 510 is devoted to totally-enclosed fan-cooled motors; No. 514 on single-phase capacitator motors. Engineering data are included.

CARBURIZING FURNACES — Surface Combustion Corp., Toledo, O., has issued bulletin No. SC-64 on its horizontal type batch gas-carburizing furnaces, including performance data and describing advantages in use of the furnaces. It is illustrated.

ENGINEERING DATA SHEETS—Ampco Metal Inc., Milwaukee, is issuing monthly data sheets covering services, properties and characteristics of Ampco metal. They will also cover technical phases of other alloys produced by this company and with unusual service installations.

STAINLESS STEEL—Republic Steel Corp., Central Alloy district, Massillon, O., has issued a new edition of its booklet on Enduro 18-8 stainless steels. A feature is a table showing the degree of corrosion resistance exerted in the presence of several hundred chemicals, solutions and other reagents. It is listed as booket 125-A.

VALVES—Homestead Valve Mfg. Co., Coraopolis, Pa., has issued an illustrated reference book, No. 37, describing its complete line of valves, including its newer products, protected-seat hydraulic operating valves and protected-seat spray valves used in control of hydraulic spray systems for descaling of steel. It is illustrated to show various installations.

WASHERS AND STAMPINGS — Wrought Washer Mfg. Co., Milwaukee, has prepared for distribution a manual for engineers, designers and manufacturers of automotive products. It deals with special washers and stampings and lists over 19,000 tool-sets for production of washers and stampings for practically every automobile product now manufactured. Use of these readily available items saves much tool cost to manufacturers.

Historical Concept vs. Technical Fact

(*Continued from Page* 28)

years of the Republic her output had risen enormously and was further augmented under the Empire by the accession of Noricum (16 B. C.).

That this increase was due chiefly to the multiplication of units is self-evident, for, though furnaces were then larger, the yield in forgeable iron rarely exceeded 100 pounds. But if unit production was only slightly increased by the employment of bellows, a marked improvement in quality may be traced to their use. This would be especially true with the manganiferous spathics of Noricum, from which, and at will, the iron-master of the Empire produced steel or high carbon iron.

Able to Vary Hardness

If a hard iron were desired, more and thicker charcoal would be added and, by continuing the process longer with a reduced draft, carbon was absorbed in approximately the required amounts. Obviously, to obtain a soft iron the process would be reversed. Under spur of necessity Rome might have devised mechanical means for creating a blast, thereby anticipating by more than a thousand years smelting of iron on a large scale.

Excellence for its own sake was, however, no concern of the Romans, and with iron, as in other industrial activities, mere superiority was the ultimate goal. This may serve to explain why greater progress was made in fabricating and finishing. It was the technique of the East first tapped by Rome in the conquest of Italy (358-266 B. C.) which lay at the base of this branch of her metallurgy.

Pliny and Diodorus are most informing of all the contemporary writers, but as they merely record what they observed, or were told, theirs are the comments of laymen dealing only in episodes. Both make it equally clear that decarburization had long been the bane of the Roman metallurgist; and that to retain hardness, or to restore it in the cutting edge was a most difficult problem. How well they succeded may be judged from the increasing numbers of intricate and highly purposeful tools.

That some method of carburization was employed has been convincingly established by the recent metallographic studies of Carpenter and Robinson. Neumann, who has also examined a number of specimens, concludes that the Romans of 200 A. D. were acquainted with carburizing. As to the method itself, Pliny's reference suggests the "boiling in sow metal" process of the late Middle Ages described by Agricola. Certainly the "nucleus ferri especially adapted for hardening" was high carbon iron, since, "prepared in another manner it is suitable for making thick anvils or heads of hammers."

Heated in Charcoal Fire

It is highly improbable that such a method of carburizing was ever in general use. Comparable results were more readily attainable, for, as Stead points out, "it is easy to conceive how pieces of iron could be carburized by embedding them in the heart of a charcoal fire and maintaining them at a high temperature by using a blast insufficiently strong to penetrate to the center of the hearth."

Water was the recognized quenching medium, although, on the authority of Pliny, many small objects were hardened in oil. Bilbilis, Turiasso, Comum and other localities renowned for their iron may have evolved a tempering process which they adroitly concealed from prying competitors by attributing excellence to the "quality of water into which the red-hot metal is plunged."

It is impossible as yet to affirm or deny that the Romans tempered their carburized iron. The broad assumption is that they did, for it is quite inconceivable that having advanced to this final, all-important phase of heat treatment they could fail to complete the cycle. On the other hand, successful tempering requires controlled temperatures regulated to the varying composition of the iron-carbon alloy. Tempering would, therefore, be only possible in those favored localities where repetitive operations with a uniform product afforded opportunity for observing the effects as measured by the various oxidation colors. Even at best the difficulties were enormous and the results always uncertain.

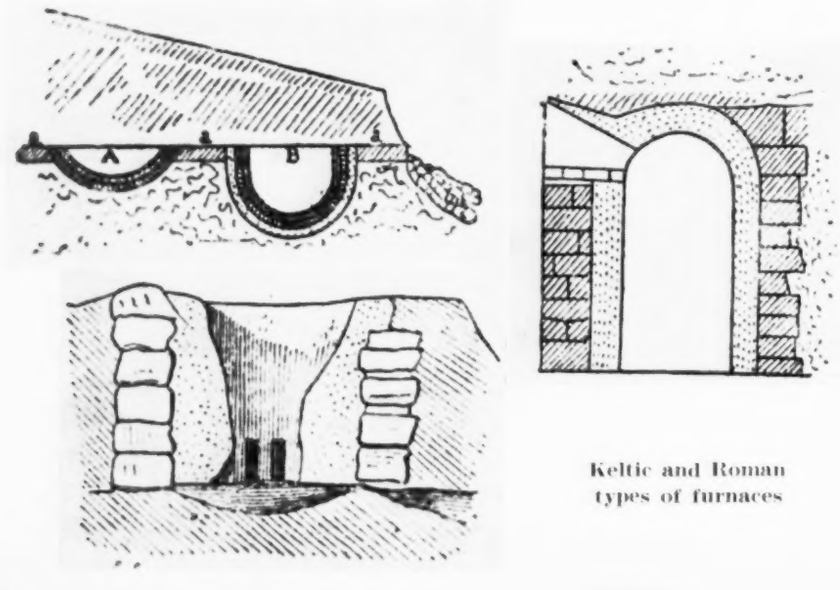
There is nothing to indicate that the Romans ever made iron or steel by a fusion process. That they occasionally produced an amorphous iron carbide is apparent from the statement of Pliny: "It is a remarkable fact that when iron ore is fused it becomes liquefied like water and afterward acquires a brittle, spongy texture." As no further comment is made, and as no other Latin writers refer to a fusion process, it is reasonable to assume that such fortuitous production was considered a total loss, and the resulting metal either scrapped or reworked with subsequent charges.

Imported Steel from India

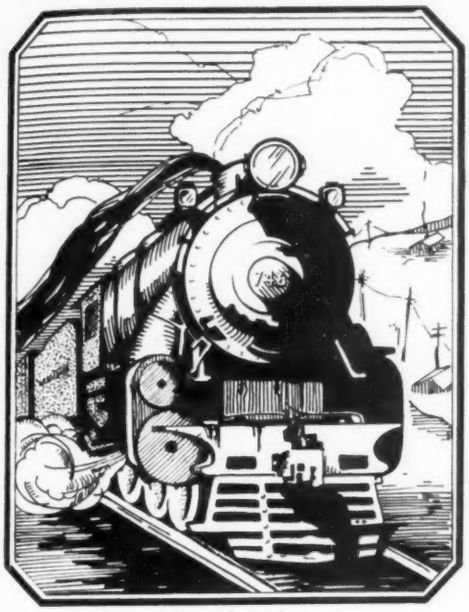
But if Rome was ignorant of, or oblivious to, the merits of a fusion process, there is tacit recognition of it in the fact that steel for their best implements and weapons was brought in from the East. Pliny wrongly credits the Chinese, but in this he is purposely misled, as were the more skeptical Roman ambassadors referred to by Gibbon. It is now known that this steel, so highly prized by the Romans, was a product of India, made from the black magnetite sands of Hyderabad. And as Damascus or Wootz, this Indian-made steel was held in equal esteem by medieval and modern Europe.

The charge, consisting of black magnetite ore, bamboo-charcoal and the green leaves of certain carbonaceous plants, was sealed in a crucible made from native clay. Several of these would be set in the hearth which was then filled with charcoal and the furnace lighted. Gradually raising the temperature to a point where the charge became molten (approximately 3000 degrees Fahr.), an iron-carbon alloy was thrown out of solution and solidified in mass at the bottom of the crucible.

This metallic button or mass, mechanically separated from its slag, was then alternately melted and



Keltic and Roman types of furnaces



Many Powerful Giants of the Steel Rails carry Boilers and Fire Boxes made of

WORTH STEEL PLATE

Sheared Steel Plates up to 150" wide in the following specifications:

Tank or Structural—Copper Bearing Steel—Pressing Steel—Flange or Boiler Steel—Ordinary Fire Box—Still Bottom—Locomotive Fire Box—Marine—Material subject to Navy Department specifications or inspection—Navy Department Boiler Steel (Classes A, B and C)—Hull Plates to Lloyds and American Bureau Specifications. We also manufacture steel plates to all A.S.M.E. and A.S.T.M. Specifications for use in high pressure vessels.

Flanged and Dished Heads up to large diameters and very heavy gauges in Standard, A.S.M.E., elliptical and shallow dish specifications.

Blue Annealed Sheets in all gauges down to #16 and widths up to 60". Greater widths on application.

We would consider it a privilege to quote you prices or give further information on any of our products. Our motto is, "Quality Products plus prompt Service."

WORTH STEEL COMPANY · CLAYMONT · DEL.

cooled again four or five times—each complete operating cycle requiring a day. Then in round cakes about 5 inches in diameter and ½-inch thick, each of which weighed approximately two pounds, the metal was carried overland by caravan to the arms-making centers of western Asia; or if for export, to the various shipping points.

A long normalizing treatment preceded the forging operation, which was done with great care, flowing the metal in two or more directions with light blows of the hammer. After prolonged annealing the blades were quenched and drawn to the desired hardness, then polished and etched. This last operation brought to the surface the damask inherent in the steel; and its pattern and background color determined the quality.

Belaiew contends that the best Damascus is a hypereutectoid steel and gives the analysis of an unusually beautiful blade as: C, 1.49; Mn, 0.08; Si, 0.005; S, 0.05; and P, 0.10 per cent.

True Indian steel was in no way related to the degenerate wrought product composed of bars and wire welded together, and then falsely damascened by cross forging. It is also distinct from the Persian, where the charge, although melted in crucibles, was wrought iron and charcoal.

Chalybes' Product Traditional

No precise information exists as to the method employed by the Chalybes. Strabo mentions their iron mines and Pliny their forges. Aristotle's brief account holds the only clue, implying as it does that a crucible process was used. Nor is it impossible that the writers again were deliberately misled and that the Chalybe, after all, merely served as a cloak for the actual producer. Be that as it may, they and their iron were already a tradition in the days of Aeschylus, a tradition that still lives in Anglicized form in our word, "chalybeate."

Other than the Indian and the Chalybian, ironmaking in the East seems to have followed the European method, or, in the less accessible areas, to have been a yet cruder survival of neo-primitive forms. Subsequent research may perhaps prove the Assyrians an exception. Judged solely by amount, the iron at Nineveh represents either a gradual accumulation through conquest and trade or the large-scale production of a super-technique.

As a dynamic entity ancient civilization ends with the reign of Hadrian, though outwardly it lingers a few centuries more. And it is from this, the post-ancient period, that two most remarkable specimens of iron have come down. The Delhi column, from which the Indian city takes its name, is dated approximately 300 A. D. Whether built-up by welding small sections or forged in a single unit, it attests the skill of the unknown ironmaster of sixteen centuries ago.

The shaft itself, 12½ inches in diameter at the top and 16½ inches at the base, is nearly 24 feet long, and weighs by estimate somewhat more than six tons. Hadfield, who microscopically examined a small section, reports the analysis as follows: C, 0.08; Mn, nil; Si, 0.046; S, 0.006; P, 0.114; and Fe, 99.70 per cent. Specific gravity is 7.81 and brinell hardness 188.

Cannot Fathom Corrosion Resistance

Obviously the hardness is not representative, for it compares with the working maximum obtainable from a heat treated 0.40 to 0.50 carbon steel of equivalent mass. Neither microscope nor analysis have yet given a clue to what is metallurgically the most significant characteristic of this remarkable column; its corrosion resistance. There it stands after sixteen hundred years of exposure to the elements in as perfect condition as when first erected. It is decidedly questionable whether modern iron or steel, similarly exposed, could have endured that long.

The site of Roman Corstopitum lies immediately west of the English village of Corbridge on the north bank of the Tyne. Here the largest known mass of Roman iron was found in 1909.* From the collateral evidence a fourth century A. D. dating may be safely assigned. The examinations of Louis and Stead have disclosed not only the characteristics of the bloom itself, but in general the difficulties inherent to the production of large masses by the ancient methods.

Found in what appears to have been a reheating furnace, the bloom measures 39 inches in length, and is approximately 7 inches square at one end and 5 inches square at the other. Its net weight is 344 pounds. That work was in progress when the bloom was abandoned is apparent from a photograph of the longitudinal section, which also reveals what has long been suspected, that the larger masses of ancient iron were composed of small sections welded together. Based on Stead's drawing, the largest single unit in the Corstopitum bloom did not exceed 40 pounds in weight.

Chemical analysis showed the usual variation in carbon for direct process iron, this ranging from 0.02 per cent in one section of the lower end to 0.29 per cent in another near the top. The average composition according to Stead is: C, 0.097; Mn, 0.04; Si, 0.046; S, 0.025; P, 0.044; Cu, 0.01, and slag, 0.38 per cent.

Compared with the Delhi iron, the essential difference is a lower phosphorus content and the inclusion of slag. Surftce corrosion, nonexistent in the column, has penetrated the bloom to a minimum depth of ¼-inch.

It is interesting to observe that Hallstatt and La Tene iron, judged by analysis alone, is not inferior to either the Delhi or Corstopitum metal. It also compares favorably with modern wrought iron:

	Hallstatt		La Tene		Modern Muck
	Sword	Lance	Lance	Ring	Bar
C	.17	.63	.10 to .53	.21	.06
Mn	.....	.....	.....	.....	.07
Si	.04	.046	.255	.056	.15
P	.01	.045	.05	.122	.10
S	.008	trace	.019	.031	.016

Possibly the higher carbons of the La Tene and Hallstatt iron were intentional but, if so, they reflect the indeterminate technique of the primitive ironmaster.

*If the iron anchor in Lake Nemi can be authoritatively dated to Caligula's reign, that, and not the bloom of Corstopitum, is the "largest known mass of Roman iron." According to Speziale the Nemi anchor weighs 1275 pounds, and is "forged from four lumps of metal—three for the shank and arms and one for the stock."

Activities of Steel Users and Makers

WILLIAMSPORT WIRE ROPE CO., Williamsport, Pa., plans to purchase the plant of the Beth Mary Wire Rope Co., Sparrows Point, Md., a subsidiary of the Bethlehem Steel Corp., in accordance with an agreement made five years ago. At that time the Williamsport company rented the plant at $5000 annually with an option to buy April 1, 1935, on payment of $87,000. Investment in the Beth Mary plant by the Williamsport company is said to be at least $125,000, a reason for taking up the option. Receivers have practically lifted the Williamsport Wire Rope Co. from its financial difficulties and a plea is now before the court to allow it to reorganize and regain its place outside receivership.

□ □ □

Peerless Sand Co., Conneaut, O., has changed its name to Peerless Mineral Products Co., to better describe its line of materials for foundry use. Management of the company remains unchanged with F. L. Moore president and general manager.

□ □ □

Link-Belt Co., New York, has appointed General Supply Co., S. A., Calle Balderas No. 56, Mexico, D. F., its stock-carrying distributor of conveying and power-transmitting machinery in the federal district and state of Mexico. Albert Isaac is president and K. O. Nellen manager of the General Supply Co.

Pig Iron in Strong Gain; Steel Rate Is Steadier

February Output Up 21%; Shipments Sustained; Scrap Soft

> ***THE MARKETS IN TABLOID***
>
> **DEMAND** . . . Steady, best for flat rolled products.
>
> **PRICES** . . . Finished steel, pig iron steady. Scrap off 50 cents to $1. Nuts and bolts up 5 points.
>
> **PRODUCTION** . . . Down moderately.
>
> **SHIPMENTS** . . . Finished steel, pig iron, coke sustained.

PIG iron production in February made another substantial gain, the fifth consecutive month. Daily average output at 57,686 gross tons was up 20.9 per cent, and the total—1,615,207 tons—was 9.2 per cent above January.

These tonnages were the largest since last June. The number of active stacks was increased by 7 to 96, operating Feb. 28. For the two months this year, output at 3,093,650 tons is an increase of 23.9 per cent over the comparable period in 1934.

There are strong indications that February daily average steel ingot production will vary little from the January level, when tonnage figures are announced this week. From the fact the rate declined only 2 points to 48 per cent last week it is believed much of the weakness in the situation has been overcome, and operations are at least becoming more stable.

So far this year the steel rate is 13 points above the average of the year 1934, tending to duplicate the 12-point gain made in 1934 over 1933. At the moment it appears iron and steel consumption is moving on a fairly even plane, with structural and railroad work in the spring months to be the determining factor in the volume of business for the first half.

Shipments of finished steel, pig iron and coke are holding up, though pressure for deliveries to the automobile industry has relaxed. Largely due to an outpouring of scrap from this industry's increased operations, and a slower demand, scrap prices again have declined sharply, STEEL's scrap composite being off 42 cents to $11.16, lowest since the middle of December.

Automobile production continues to gain slowly, 84,000 cars last week bringing the total for February to about 325,000, compared with 293,000 in January. March output should show a little further improvement.

Railroads are awaiting first quarter earnings statements before formulating definite buying plans. Steelmakers do not expect much from them before April or May. Practically all western roads and many eastern lines will purchase some rails, though recent estimates have been revised downward. Truck transportation is cutting in heavily, while freight car loadings have declined three consecutive weeks, contrary to the usual trend at this time.

New York Central opened bids last week and is about to award 20,000 tons of rails and 9500 tons of fastenings, a mere shadow of its former purchases, which in 1930 included 175,000 tons of rails. Structural shape awards last week were 11,321 tons, slightly above the preceding week.

The extension of prices for second quarter has not been followed by any general commitments for that period, except by automobile manufacturers. Nut and bolt prices have been advanced 5 points. Mail order houses by reducing prices sufficient to absorb sales taxes on wire and nails are taking away considerable jobber and dealer business from mills.

There is a strong feeling in the industry that if the country can steer clear of labor dissensions iron and steel demand will become insistent enough to build up a new peak before summer. The Nields decision clearly renders NRA's section 7A inapplicable to the actual processes of iron and steel manufacture; it also establishes the legality and effectiveness of employe representation plans.

Steelworks operations in the Pittsburgh district last week were unchanged at 37 per cent; Chicago 53; Detroit 100; New England 63; Birmingham 55½. Wheeling was down 7 points to 78; Cleveland 5 to 74; Buffalo 5 to 40; eastern Pennsylvania 1½ to 29½; Youngstown 8 to 50.

Due to the decline in scrap, STEEL's iron and steel price composite is down 8 cents to $32.42, while finished steel holds at $54.

COMPOSITE MARKET AVERAGES

	March 2	Feb. 23	Feb. 16	One Month Ago Feb., 1935	Three Months Ago Dec., 1934	One Year Ago March, 1934	Five Years Ago March, 1930
Iron and Steel	$32.42	$32.50	$32.54	$32.54	$32.39	$31.38	$34.79
Finished Steel	54.00	54.00	54.00	54.00	54.00	51.10	54.88
Steelworks Scrap	11.16	11.58	11.75	11.66	11.02	12.30	14.52

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	March 2 1935	Feb., 1935	Dec., 1934	Mar., 1934
Steel bars, Pittsburgh	1.80c	1.80c	1.80c	1.75c
Steel bars, Chicago	1.85	1.85	1.85	1.80
Steel bars, Philadelphia	2.09	2.09	2.09	2.04
Iron bars, Terre Haute, Ind.	1.75	1.75	1.75	1.60
Shapes, Pittsburgh	1.80	1.80	1.80	1.70
Shapes, Philadelphia	2.00½	2.00½	2.00½	1.90½
Shapes, Chicago	1.85	1.85	1.85	1.75
Tank plates, Pittsburgh	1.80	1.80	1.80	1.70
Tank plates, Philadelphia	1.98½	1.98½	1.98½	1.88½
Tank plates, Chicago	1.85	1.85	1.85	1.75
Sheets, No. 10, hot rolled, Pitts.	1.85	1.85	1.85	1.75
Sheets, No. 24, hot ann., Pitts	2.40	2.40	2.40	2.25
Sheets, No. 24, galvan., Pitts.	3.10	3.10	3.10	2.85
Sheets, No. 10, hot rolled, Gary	1.95	1.95	1.95	1.85
Sheets, No. 24, hot anneal., Gary	2.55	2.55	2.55	2.35
Sheets, No. 24, galvan., Gary	3.20	3.20	3.20	2.95
Plain wire, Pittsburgh	2.30	2.30	2.30	2.20
Tin plate, per base box, Pitts.	5.25	5.25	5.25	5.25
Wire nails, Pittsburgh	2.60	2.60	2.60	2.35

Semifinished Material

Sheet bars, open-hearth, Youngs.	$28.00	$28.00	$28.00	$26.00
Sheet bars, open-hearth, Pitts.	28.00	28.00	28.00	26.00
Billets, open-hearth, Pittsburgh	27.00	27.00	27.00	26.00
Wire rods, Pittsburgh	38.00	38.00	38.00	36.00

Pig Iron

	March 2, 1935	Feb., 1935	Dec., 1934	Mar., 1934
Bessemer, del. Pittsburgh	$19.76	$19.76	$19.76	$19.26
Basic, Valley	18.00	18.00	18.00	17.00
Basic, eastern, del. eastern Pa.	19.76	19.76	19.76	18.76
No. 2, foundry, del. Pittsburgh	19.26	19.26	19.26	18.76
No. 2, foundry, Chicago	18.50	18.50	18.50	17.50
Southern No. 2, Birmingham	14.50	14.50	14.50	13.50
No. 2X eastern, del. Philadelphia	20.63	20.63	20.63	19.63
Malleable, Valley	18.50	18.50	18.50	17.50
Malleable, Chicago	18.50	18.50	18.50	17.50
Lake Superior charcoal, del. Chi.	24.04	24.04	24.04	23.54
Ferromanganese, del. Pittsburgh	89.79	89.79	89.79	90.24
Gray forge, del. Pittsburgh	18.63	18.63	18.63	18.38

Scrap

Heavy melting steel, Pittsburgh	$12.75	$13.25	$12.95	$14.35
Heavy melt. steel, No. 2, east. Pa.	9.75	10.12	9.30	9.70
Heavy melting steel, Chicago	10.75	11.65	10.55	12.00
Rails for rolling, Chicago	11.75	12.55	11.65	12.75
Railroad steel specialties, Chicago	11.75	12.50	11.90	13.00

Coke

Connellsville, furnace, ovens	$3.60	$ 3.60	$3.60	$3.35
Connellsville, foundry, ovens	4.60	4.60	4.60	4.25
Chicago, by-product foundry, del.	9.25	9.25	9.25	9.25

Steel, Iron, Raw Material, Fuel and Metals Prices

Prices are code levels filed with American Iron and Steel Institute, 350 Fifth avenue, New York. Except when otherwise designated, prices are base, f.o.b. cars. Asterisk denotes price change this week.

Sheet Steel

Hot Rolled No. 10, 24-48 in.

Pittsburgh	1.85c
Gary	1.95c
Chicago, delivered	1.98c
New York, del.	2.18c
Philadelphia, del	2.14c
Birmingham	2.00c
St. Louis, del.	2.17c
Pacific ports, f.o.b. cars, dock	2.40c

Hot Rolled Annealed No. 24

Pittsburgh	2.40c
Gary	2.50c
Chicago, delivered	2.53c
Detroit, delivered	2.60c
New York, del.	2.73c
Philadelphia, del.	2.69c
Birmingham	2.55c
St. Louis, del.	2.72c
Pacific ports, f.o.b. cars, dock	3.05c

Galvanized No. 24

Pittsburgh	3.10c
Gary	3.20c
Chicago, delivered	3.23c
Philadelphia, del.	3.39c
New York, del.	3.43c
Birmingham	3.25c
St. Louis, del.	3.42c
Pacific ports, f.o.b. cars, dock	3.70c

Tin Mill Black No. 28

Pittsburgh	2.75c
Gary	2.85c
St. Louis, delivered	3.07c

Cold Rolled No. 10

Pittsburgh	2.50c
Gary	2.60c
Detroit, delivered	2.70c
Philadelphia, del.	2.79c
New York, del.	2.83c
Pacific ports, f.o.b. cars, dock	3.10c

Cold Rolled No. 20

Pittsburgh	2.95c
Gary	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.24c
New York, del.	3.28c

Enameling Sheets

Pittsburgh, No. 10	2.50c
Pittsburgh, No. 20	3.10c

Tin and Terne Plate

Gary base, 10 cents higher.

Tin plate, coke base con. (box) Pitts.	$5.25
Do., waste-waste	2.75c
Do., strips	2.50c
Long ternes, No. 24 unassorted, Pitts.	3.40c
Do., Gary	3.50c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	23.00	24.00
Plates	26.00	28.00
Sheets	33.00	35.00
Hot strip	20.75	22.75
Cold strip	27.00	29.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	17.00	18.50	21.00	26.00
Plates	20.00	21.50	24.00	29.00
Sheets	25.00	28.00	31.00	35.00
Hot strip	15.75	16.75	21.75	26.75
Cold stp.	20.50	22.00	27.00	35.00

Steel Plates

Pittsburgh	1.80c
New York, del.	2.08c
Philadelphia, del.	1.98½c
Boston, delivered	2.20c
Buffalo, delivered	2.03½c
Chicago or Gary	1.85c
Cleveland, del.	1.98½c
Birmingham	1.95c
Coatesville, base	1.90c
Sparrows Pt., base	1.90c
Pacific ports, f.o.b. cars, dock	2.35c
St. Louis, delivered	2.07c

Structural Shapes

Pittsburgh	1.80c
Philadelphia, del.	2.00½c
New York, del.	2.05½c
Boston, delivered	2.18½c
Bethlehem	1.90c
Chicago	1.85c
Cleveland, del.	1.98½c
Buffalo	1.90c
Gulf Ports	2.20c
Birmingham	1.95c
Pacific ports, f.o.b. cars, dock	2.35c

Bars

Soft Steel

Pittsburgh	1.80c
Chicago or Gary	1.85c
Duluth	1.95c
Birmingham	1.95c
Cleveland	1.85c
Buffalo	1.90c
Detroit, delivered	1.95c
Pacific Coast ports cars, dock, c.i.f.	2.35c
Philadelphia, del.	2.09c
Boston, delivered	2.20c
New York, del.	2.13c
Pitts., forg. qual.	1.95c-2.05c

Rail Steel

To Manufacturing Trade

Pittsburgh	1.70c
Chicago or Gary	1.75c
Moline, Ill.	1.75c
Cleveland	1.75c
Buffalo	1.80c

IRON

Troy, N. Y.	1.70c
Terre Haute, Ind.	1.75c
Chicago	1.80c
Philadelphia	1.89c
Pittsburgh, refined	2.75-7.50c

REINFORCING

New billet, straight lengths, quoted by distributors.

Pittsburgh	2.05c
Chicago, Gary, Buffalo Cleve., Birm., Young	2.10c
Gulf ports	2.45c
Pacific coast ports f.o.b. cars dock	2.45c
Philadelphia, del.	2.34c

Rail Steel

Straight lengths quoted by distributors

Pittsburgh	1.90c
Chicago, Buffalo, Cleveland, Birm., Young	1.95c
Gulf ports	2.30c

Wire Products

(Prices apply to straight or mixed carloads; pool cars, or less, 15c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pitts.-Cleve. 100 lb. keg

Standard wire nails	$2.60
Cement coated nails	2.60
Galvanized nails, 15 gage and coarser	4.60c
do., 16 gage and finer	5.10c

(Per pound)

Polished staples	3.30c
Galvanized fence staples	3.55c
Barbed wire, galv.	3.00c
Annealed fence wire	2.45c
Galvanized fence wire	2.80c
Woven wire fencing (base column, c.l.)	$63.00
Plain wire, 6-9 gage to mfg. trade	2.30c

Anderson, Ind., (merchant products only) and Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire, Pittsburgh or Cleveland	2.90c

Do., Chicago up $1, Worcester, $2.

Cold-Finished Carbon Bars and Shafting

Base Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs.	2.10c
20,000 to 59,999 lbs.	2.05c
60,000 to 99,999 lbs.	2.00c
100,000 lbs and over	1.97½c

Gary, Ind., Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Alloy Steel Bars (Hot)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.45c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo....0.50
4600 0.20 to 0.30 Mo. 1.25 1.75 Ni. 1.05
5100 0.80-1.10 Cr 0.45
5100 Cr. spring ....base
6100 bars 1.20
6100 spring 0.70
Cr., Ni., Van....1.50
Carbon Van. 0.95
9250....Carbon base plus extras

Piling

Pittsburgh	2.15c
Chicago, Buffalo	2.25c

Strip and Hoops

Hot strip to 23½-in. Pittsburgh	1.85c
Chicago, base	1.95c
Birmingham base,	2.00c
Detroit, delivered	2.05c
Phila., delivered	2.14c
New York, del.	2.18c
Cooperage hoop, Pittsburgh	1.95c
Chicago	2.05c
Cold-rolled strip, Pitts., Cleve.	2.60c
Worcester, Mass.	2.80c

Rails, Track Material

(Gross Tons)

Standard rails, mill	$36.37½
Relay rails, Pitts. 24-45 lbs.	$26.00
50-60 lbs.	$23.00
70-75 lbs.	$20.00
80-85 lbs.	$24.00
100 lbs.	$25.00
Light Rails billet qual. Pitts., Chi.	$35.00
Do., reroll. qual.	$34.00
Angle bars, mills	2.55c
Spikes, R. R. base	2.40c
Track bolts, base	3.55c
Tie plates, base	1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs. up $8; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots, Dec. 1, 1932, lists, 10% extra for less full containers.

CARRIAGE BOLTS

*All sizes, cut thread	70-10-5 off
*Rolled thread, ½ x 6 smaller	70-10-5 off

MACHINE BOLTS

*All sizes, cut thread lag screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts.	70-10-5 off
*Tire bolts	60-5 off
Stove bolts, 75 off in pkgs.; 83 off on 15,000 of 3-inch and shorter, or 5000 over 3-inch	
*Rolled thread machine bolts, ½ x 6 and smaller	70-10-5 off
*Step bolts	70-5 off
*Elevator bolts	70-5 off

NUTS

*S.A.E. semifinished hex.; ½ to ⅞-inch	70-10-5 off
Do., ½ to 1-inch	70-10-5 off
Do., over 1-inch	70-5 off

HEXAGON CAP SCREWS

Milled	85 off
Upset, 1-in., smaller	85 off

SQUARE HEAD SET SCREWS

Upset, 1-in. small	70-10 off
Headless set screws	75 off

Rivets, Wrought Washers

Struc., c. l., Pittsburgh, Cleveland..	2.90c
Struc., c. l., Chicago ⅞-in. and smaller,	3.00c
Pitts., Chi., Cleve.	70 and 5 off
Wrought washers, Pitts., Chi., Phila.	6.25 off

Cut Nails

Cut nails, Pitts.; (10% discount on size extras)	$2.75
Do. less carloads, 5 kegs or more no discount on size extras	$3.05
Do. under 5 kegs; no discount on size extras	$3.20

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads, Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD

In.	Blk.	Gal.
Steel		
¼ and ⅜	53½	35
½	58½	47
¾	62	52
1—3	64	55
Iron		
½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

LAP WELD

Steel		
2	60	51
2½—3	63	54
3½—6	65	56
7 and 8	64	54
9 and 10	63½	53½
Iron		
2	37	22½
2½—3½	38	25
4—8	40	28½

LINE PIPE

Steel	
½, butt weld	57½
⅛-inch, butt weld	50½
¼—⅜, butt weld	52½
¾, butt weld	61
1—3, butt weld	63
2-inch, lap weld	59
2½—3, lap weld	62
3½—6, lap weld	64
7—8, lap weld	63
Iron	

⅛—1½ inch, black and galv. take 4 pts, over; 2½—6 inch 2 pts. over discounts for same sizes, standard pipe lists, 8—12-inch, no extra.

BOILER TUBES

C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		*Charcoal Iron*	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3½	50	3	17
4	52	3¼—3½	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 points under base.

SEAMLESS BOILER TUBES

Under date of May 15 in lots of 40,000 pounds or more for cold-drawn boiler tubes and in lots of 40,000 pounds or feet or more for hot-finished boiler tubes, revised prices are quoted for 55 cold-drawn boiler tube sizes ranging from ¼ to 6-inch outside diameter in 30 wall thicknesses, decimal equivalent from 0.035 to 1.000, on a dollars and cents basis per 100 feet and per pound.

Hot-finished carbon steel boiler tube prices also under date of May 15 range from 1 through 7 inches outside diameter, inclusive, and embrace 47 size classifications in 22 decimal wall thicknesses ranging from 0.109 to 1.000, prices also being on a lb. and 100 ft. basis.

Seamless Tubing

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs.	32%
15,000 ft. or 22,500 lbs.	70%

Cast Iron Water Pipe

Class B Pipe—Per Net Ton

6-in. & over, Birm.	$38.00-39.00
4-in., Birmingham	41.00-42.00
4-in., Chicago	49.00-50.00
6 to 24-in., Chicago	46.00-47.00
6-in. & over, east fdy.	42.00
Do., 4-in.	45.00

Class A pipe $3 over Class B. Stnd. fitgs., Birm. base....$100.00

Semifinished Steel

BILLETS AND BLOOMS

4 x 4-inch base; gross ton

Pitts., Chi., Cleve., and Youngstown	$27.00
Philadelphia	32.30
Duluth	31.00
Forging, Pitts., Chi. and Buffalo	32.00
Forging, Duluth	36.00

SHEET BARS

Pitts., Cleve., Young., Chi., Buff., Canton, Sparrows Pt.	28.00

SLABS

Pitts., Cleve., Young.	27.00

WIRE RODS

(Common; combination up $2)

Pitts., Cleveland	38.00
Chicago	39.00
Worcester, Mass.	40.00

SKELP

Pitts., Chi., Young., Buff., Coatesville, Sparrows Point	1.70c

Coke

Price Per Net Ton

BEEHIVE OVENS

Connellsville, fur.	$3.60- 3.85
Connellsville, fdry.	4.60
Connel. prem. fdry.	5.10
New River fdry.	6.00
Wise county fdry.	4.45- 5.25
Wise county fur.	4.00- 4.50

BY-PRODUCT FOUNDRY

Newark, N. J., del.	9.20- 9.65
Chi., ov., outside del.	8.50
Chicago, del.	9.25
New England, del.	11.00
St. Louis, del.	9.25
Birmingham, ovens	6.00
Indianapolis, del.	8.75
Cincinnati, del.	9.30
Cleveland, del.	9.25
Buffalo, ovens	7.50- 8.00
Detroit ov., out. del.	8.50
Philadelphia, del.	9.00

Coke By-Products

Per gallon, producers' plants.

Tank lots	Spot
Pure and 90% benzol	15.00c
Toluol	30.00c
Solvent naphtha	26.00c
Commercial xylol	26.00c

Per lb. f.o.b. New York.

Phenol (200 lb. drums)	16.30c
Do. (100 lbs.)	17.30c

Eastern Plants, per lb.

Naphthalene flakes and balls, in bbls.	5.00c

Per 100 lb. Atlantic seaboard

Sulphate of ammonia	$1.20

†Western prices, ½-cent up.

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25; 50c diff. for each 0.25 below 1.75. Gross tons.

Basing Points:	No. 2 Fdry.	Malle-able	Basic	Besse-mer
Bethlehem, Pa.	$19.50	$20.00	$19.00	$20.50
Birdsboro, Po.	19.50	20.00	19.00	20.50
Birmingham, Ala., southern del...	14.50	14.50	13.50	19.00
Buffalo	18.50	19.00	17.50	19.50
Chicago	18.50	18.50	18.00	19.00
Cleveland	18.50	18.50	18.00	19.00
Detroit	18.50	18.50	18.00	19.00
Duluth	19.00	19.00	.....	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Everett, Mass.	19.50	20.00	19.00	20.50
Granite City, Ill.	18.50	18.50	18.00	.....
Hamilton, O.	18.50	18.50	18.00	19.00
Jackson, O.	20.25	20.25	19.75	.....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Provo, Utah	17.50	.....	17.00	.....
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Sparrows Point, Md.	19.50	.....	19.00	.....
Swedeland, Pa.	19.50	20.00	19.00	20.50
Toledo, O.	18.50	18.50	18.00	19.00
Youngstown, O.	18.50	18.50	18.00	19.00
Delivered from Basing Points:				
Akron, O., from Cleveland	19.76	19.76	19.26	20.26
Baltimore from Birmingham	20.02	.....	19.90	.....
Boston from Birmingham	19.62	.....	19.50	.....
Boston from Everett, Mass.	20.00	20.50	19.50	21.00
Boston from Buffalo	20.00	20.50	19.50	21.00
Brooklyn, N. Y., from Bethlehem	21.77	22.27	.....	.....
Brooklyn, N. Y., from Bmgham..	21.30	.....	.....	.....
Canton, O., from Cleveland	19.76	19.76	19.26	20.26
Chicago from Birmingham	†18.72	.....	18.60	.....
Cincinnati from Hamilton, O.	19.51	19.51	19.01	.....
Cincinnati from Birmingham	19.13	.....	19.01	.....
Cleveland from Birmingham	18.62	.....	18.50	.....
Indianapolis from Hamilton, O...	20.77	20.77	20.27	21.27
Mansfield, O., from Toledo, O.	20.26	20.26	19.76	20.76
Milwaukee from Chicago	19.50	19.50	19.00	20.00
Muskegon, Mich., from Chicago, Toledo or Detroit	21.40	21.40	20.90	21.90
Newark, N. J., from Birmingham	20.51	.....	.....	.....
Newark, N. J., from Bethlehem..	20.89	21.39	.....	.....
Philadelphia from Birmingham..	19.88	.....	19.76	.....
Philadelphia from Swedeland, Pa.	20.26	20.76	19.76	.....
Pittsburgh district from Neville Island	Neville base plus 63c, 76c and $1.13 switching charges			
Saginaw, Mich., from Detroit	20.60	20.60	20.10	21.10

Delivered from Basing Points:	No. 2 Fdry.	Malle-able	Basic	Besse-mer
St. Louis from Granite City, Ill.	19.00	19.00	18.50	.....
St. Louis from Birmingham	18.62	.....	18.50	.....
St. Paul from Duluth	20.94	20.94	.....	21.44

†Over 0.70 phos.

Low Phos

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $23.50. Phila. base, standard and copper bearing, $24.63.

Gray Forge		Charcoal	
Valley furnace	18.00	Lake Superior fur.	21.00
Pitts. dist. fur.	18.00	Do., del. Chicago	24.04

Silvery†

Jackson County, O., base; 6% $22.75; 7—$23.75; 8—$24.75; 9—$25.70; 10—$26.75; 11—$27.75. Buffalo base prices, up $1.25.

Bessemer Ferrosilicon†

Jackson County, O., base; 10%—$27.75; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25. Buffalo base prices $1.25 higher.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Refractories

Per 1000 f.o.b. Works

Fire Clay Brick

First Quality.

Pa., Ill., Ky., Md., Ga., Mo.	$45.00
Alabama	45.00

Second Quality

Pa., Ill., Ky., Md., Mo., Ga., Ala.	40.00

Ohio

First quality	$40.00-45.00
Intermediary	37.00
Second quality	28.00

Malleable Bung Brick

All bases	50.00

Silica Brick

Pennsylvania	$45.00
Joliet, E. Chicago	54.00
Birmingham, Ala.	52.00

Magnesite

Imported dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Domestic dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	
Domestic dead-burned gr. net ton f.o.b. Chewelah, Wash. (bulk)	

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$45.00
Chemically bonded chrome brick	42.50
Magnesite brick	65.00
Chemically bonded magnesite brick	55.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$19.50
Washed gravel f.o.b. Ill., Ky., net ton, carloads	$15.50-16.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82% tidewater, duty paid	85.00
Do., Balti. base	85.00
Do., del. Pittsburgh	89.79
Spiegeleisen, 19-20% dom. Palmerton, Pa., spot†	26.00
Do., New Orleans	26.00
Ferrosilicon, 50% freight all., cl.	77.50
Do., less carload	85.00
Do., 75 per cent	126-130.00
Spot, $5 a ton higher.	
Silicomang., 2½ carb.	90.00
2% carbon, 95.00; 1%,	105.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del.	10.00
Ferrotungsten, stand., lb. cont. del.	1.35- 1.45
Ferrovanadium, 35 to 40% lb., cont., on analysis	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt. allow., lb.	7.00
do., under 1 ton	7.50
Ferrophosphorus, per ton, c. l., 17-19% Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 55-65%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads, Quan. diff. apply.

Nonferrous Prices

METAL PRICES OF THE WEEK

Spot unless otherwise specified. Cents per pound

	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead: New York	Lead: East St. L.	Zinc: St. L.	Aluminum 99%	Antimony: Chinese Spot, N. Y.	Nickel Cathodes
Feb. 23	9.00	9.12½	7.50	49.12½	49.00	3.55	3.40	3.70	*19.00	14.50	35.00
Feb. 25	9.00	9.12½	7.50	48.12½	47.87½	3.55	3.40	3.70	*19.00	14.50	35.00
Feb. 26	9.00	9.12½	7.50	47.75	47.50	3.55	3.40	3.75	*19.00	14.50	35.00
Feb. 27	9.00	9.12½	7.50	47.50	47.25	3.55	3.40	3.80	*19.00	14.50	35.00
Feb. 28	9.00	9.12½	7.50	47.35	47.00	3.55	3.40	3.85	*19.00	14.50	35.00
Mar. 1	9.00	9.12½	7.50	47.75	47.45	3.55	3.40	3.85	*19.00	14.50	35.00

*Nominal range 19.00 to 21.00c.

MILL PRODUCTS

F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 9.00c Conn. copper.

Sheets	
Yellow brass (high)	14.25
Copper, hot rolled	16.00
Lead, cut, to jobbers	7.25
Zinc, 100-lb. base	9.50
Tubes and Pipes	
High yellow brass	16.00
Seamless copper	16.25
Rods	
High yellow brass	12.75
Copper, hot rolled	13.25
Anodes	
Copper, untrimmed	13.75
Wire	
Yellow brass (high)	14.75

OLD METALS

Dcal. buying prices, cents lb.

No. 1 Composition Red Brass	
New York	4.25- 4.50
Chicago	4.37½-4.62½
*Cleveland	4.75- 5.00
St. Louis	4.75- 5.00
Heavy Copper and Wire	
New York	5.75- 6.00
*Chicago, No. 1	5.37½-5.62½
*Cleveland	5.25- 5.50
St. Louis	5.25- 5.50
Composition Brass Borings	
New York	3.75- 4.00
Light Copper	
New York	4.50- 4.75
*Chicago	4.12½-4.37½
*Cleveland	4.50- 4.75
St. Louis	4.75- 5.00
Light Brass	
*Chicago	2.12½-2.37½
*Cleveland	2.00- 2.25
Lead	
New York	2.70- 2.80
Cleveland	2.50- 2.75
Chicago	2.50- 2.75
St. Louis	2.65- 2.75
Zinc	
New York	1.75- 2.00
Cleveland	1.75- 2.00
St. Louis	2.25- 2.40
Aluminum	
Borings, Cleveland	7.25- 8.00
Mixed, cast, Clev.	11.50-12.00
Mixed, cast, St. L.	12.75-13.00
Clips, soft, Clev.	14.00-14.50

SECONDARY METALS

Brass ingot, 85-5-5-5	8.25
Stand. No. 12 Alum.	16.00-17.00

Iron and Steel Scrap Prices

Corrected to Friday night Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL

Birmingham	9.00- 9.50
Boston, dock, expt.	9.00- 9.25
Boston, domestic	7.25- 7.50
Buffalo, No. 1	12.00-12.50
Buffalo, No. 2	10.50-11.00
Chicago, No. 1	10.50-11.00
Cleveland, No. 1	10.50-11.00
Cleveland, No. 2	10.00-10.50
Detroit, No. 1	8.00- 8.50
Detroit, No. 2	7.00- 7.50
Eastern Pa., No. 1	11.00-11.50
Eastern Pa., No. 2	9.50-10.00
Federal, Ill.	8.00- 8.50
Granite City, R. R.	9.00- 9.50
Granite City, No. 2	7.25- 7.75
N. Y., deal. No. 2	7.75- 8.00
N. Y., deal. barge	9.25- 9.50
rgh, No. 1	12.50-13.00
ns	8.25- 8.75
s, No. 1	13.00-13.25

DRESSED SHEETS ☐

Buffalo, dealers	10.50-11.00
hicago, factory	9.50-10.00
icago, dealer	9.00- 9.50
eveland	10.50-11.00
troit	8.00- 8.50
Pa., new mat.	10.00-10.50
ittsburgh	12.00-12.50
t. Louis	7.00- 7.50
lleys	12.25-12.50

BUNDLED SHEETS ☐ ☐

ffalo	8.50- 9.00
ncinnati, del.	6.50- 7.00
veland	8.00- 8.50
ttsburgh	10.75-11.25
t. Louis	5.00- 5.50

SHEET CLIPPINGS, LOOSE ☐

Chicago	6.00- 6.50
Cincinnati	6.00- 6.50
Detroit	5.00- 5.50
St. Louis	5.00- 5.50

STEEL RAILS, SHORT ☐

Birmingham	12.00-12.50
Buffalo	13.00-13.50
Chicago (3 ft.)	12.50-13.00
Chicago (2 ft.)	13.50-14.00
Cincinnati, del.	12.00-12.50
Detroit	11.00-11.50
Pitts., open-hearth, 3 ft. and less	14.50-15.00
St. Louis, 2 ft. & less	12.50-13.00

STEEL RAILS, SCRAP ☐

Boston	7.00- 7.25
Chicago	10.50-11.00
Pittsburgh	13.00-13.50

STOVE PLATE ☐ ☐

Birmingham	6.00- 6.50
Boston, dealers	4.00- 4.25
Buffalo	9.25- 9.75
Chicago, net	6.50- 7.00
Cincinnati, dealers	6.00- 6.50
Detroit, net	5.75- 6.25
Eastern Pa.	8.50- 9.00
N. Y., deal. fdry.	6.00
St. Louis	5.50- 6.00

COUPLERS, SPRINGS

Buffalo	13.25-13.75
Chicago, springs	11.50-12.00
Eastern Pa.	14.50-15.00
Pittsburgh	14.50-15.00
St. Louis	10.50-11.00

ANGLE BARS—STEEL ☐

Chicago	11.50-12.00
St. Louis	11.00-11.50

RAILROAD SPECIALTIES

Chicago	11.50-12.00

LOW PHOSPHORUS

Buffalo, billets and bloom crops	13.25-13.75
Cleveland, billet, bloom crops	14.50-15.00
Eastern Pa., crops	15.00
Pittsburgh, billet, bloom crops	14.50-15.00
Pittsburgh, sheet bar crops	13.50-14.00

FROGS, SWITCHES ☐ ☐

Chicago	10.50-11.00
St. Louis, cut	10.50-11.00

SHOVELING STEEL ☐ ☐

Chicago	10.50-11.00
Federal, Ill.	8.00- 8.50
Granite City, Ill.	7.50- 8.00

RAILROAD WROUGHT ☐

Birmingham	7.50- 8.00
Boston, dealers	6.00- 6.50
Buffalo, No. 1	10.00-10.50
Buffalo, No. 2	12.00-12.50
Chicago, No. 1, net	9.50-10.00
Chicago, No. 2	10.50-11.00
Cincinnati, No. 2	8.50- 9.00
Eastern Pa.	11.00-11.50
N. Y., No. 1, deal.	7.50- 8.00
St. Louis, No. 1	7.00- 7.50
St. Louis, No. 2	9.75-10.25

SPECIFICATION PIPE ☐

Boston	3.00- 3.25
Eastern Pa.	9.50-10.00
New York, dealers	3.50- 4.00

BUSHELING ☐ ☐

Buffalo, No. 1	10.50-11.00
Chicago, No. 1	9.00- 9.50
Cinci., No. 1, deal.	6.50- 7.00
Cincinnati, No. 2	3.00- 3.50
Cleveland, No. 2	7.50- 8.00
Detroit, No. 1, new	7.00- 7.50
Valleys, new, No. 1	12.00- 12.50

MACHINE TURNINGS ☐

Birmingham	4.50- 5.00
Boston, dealers	2.00- 2.25
Buffalo	6.00- 6.50
Chicago	6.00- 6.50
Cincinnati, dealers	4.00- 4.50
Cleveland	7.00- 7.50
Detroit	4.00- 4.50
Eastern Pa.	6.50- 7.00
New York, dealers	2.75- 3.25
Pittsburgh	8.00- 8.50
St. Louis	3.50- 4.00
Valleys	8.50- 9.00

BORINGS AND TURNINGS ☐

For Blast Furnace Use

Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Cincinnati, dealers	5.00- 5.50
Cleveland	7.50- 8.00
Detroit	5.25- 5.75
Eastern Pa.	5.00
New York, dealers	1.50- 1.75
Pittsburgh	7.00- 8.00

CAST IRON BORINGS

Birmingham, plain	4.50- 5.00
Boston, chemical	6.00- 7.00
Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Chicago	6.00- 6.50
Cincinnati, dealers	4.00- 4.50
Cleveland	7.50- 8.00
Detroit	5.25- 5.75
E. Pa., chemical	11.00-12.00
New York, dealers	1.50- 1.75
Pittsburgh	7.00- 8.00
St. Louis	3.00- 3.50

PIPE AND FLUES ☐ ☐

Cincinnati, dealers	5.00- 5.50

RAILROAD GRATE BARS ☐

Buffalo	7.00- 7.50
Chicago, net	6.00- 6.50
Cincinnati	4.50- 5.00
Eastern Pa.	9.00
New York, dealers	4.00- 4.50
St. Louis	4.50- 5.00

FORGE FLASHINGS ☐ ☐

Boston, dealers	5.25- 5.50
Buffalo	10.50-11.00
Cleveland	8.50- 9.00
Detroit	7.00- 7.50

FORGE SCRAP ☐ ☐

Boston, dealers	5.50- 6.00
Chicago, heavy	11.00-11.50
Eastern Pa.	10.00

ARCH BARS, TRANSOMS

St. Louis	12.25-12.75

AXLE TURNINGS ☐ ☐

Boston, dealers	3.00- 3.50
Buffalo	7.50- 8.00
Chicago, elec. fur.	10.00-10.50
Cleveland	7.50- 8.00
Eastern Pa.	9.50
St. Louis	6.50- 7.00

STEEL CAR AXLES ☐ ☐

Birmingham	12.50-13.00
Boston, ship. point.	10.00-10.50
Buffalo	13.25-13.75
Chicago, net	14.00-14.50
Eastern Pa.	16.50-17.00
St. Louis	14.00-14.50

SHAFTING ☐ ☐

Boston, ship. point.	12.25-12.50
Eastern Pa.	17.50
New York, dealers	12.50-13.00
St. Louis	11.50-12.00

CAR WHEELS

Birmingham	9.00- 9.50
Boston, iron deal.	6.00- 6.50
Buffalo, iron	11.00-11.50
Buffalo, steel	13.00-13.50
Chicago, iron	11.00-11.50
Chicago, rolled steel	11.50-12.00
Cincinnati, iron	8.50- 9.00
Eastern Pa., iron	10.50-11.00
Eastern Pa., steel	14.50-15.00
Pittsburgh, iron	12.00-12.50
Pittsburgh, steel	14.50-15.00
St. Louis, iron	8.25- 8.75
St. Louis, steel	10.50-11.00

No. 1 CAST SCRAP ☐ ☐

Birmingham	9.50-10.00
Boston, No. 1 mach.	8.50- 9.00
Boston, No. 2	7.50
Boston, tex. con.	8.50- 9.00
Buffalo, cupola	10.50-11.00
Buffalo, mach.	11.50-12.00
Chicago, agri. net	8.00- 8.50
Chicago, auto	9.50-10.00
Chicago, mach. net	9.50-10.00
Chicago, railr'd net	8.50- 9.00
Cinci., mach. cup	9.00- 9.50
Cleveland, cupola	12.00-12.50
Detroit, net	9.50-10.00
Eastern Pa., cupola	11.50-12.00
Pittsburgh, cupola	13.00-13.50
San Francisco, del.	13.50-14.00
Seattle	7.00- 8.50
St. Louis, No. 1	9.00- 9.50
St. L., No. 1 mach.	10.25-10.75

HEAVY CAST ☐ ☐

Boston, del.	6.00- 6.25
Buffalo, break.	9.00- 9.50
Cleveland, break.	9.00- 9.50
Detroit, auto net	10.50
Detroit, break.	7.00- 7.50
Detroit, auto net	9.50-10.00
Eastern Pa.	11.00
N. Y. break. deal.	6.50- 6.75
Pittsburgh	12.00-12.50

MALLEABLE ☐ ☐

Boston, consum.	10.00-10.50
Buffalo	12.50-13.00
Chicago, R. R.	12.50-13.00
Cincinnati, agri. del.	8.75- 9.25
Cleveland, rail	12.50-13.00
Detroit, auto	11.00-11.50
St. Louis, R. R.	10.00-10.50
Eastern Pa., R. R.	11.00-11.50

RAILS FOR ROLLING ☐

5 feet and over

Birmingham	11.00-11.50
Boston, dealers	8.00- 8.50
Buffalo	12.00-12.50
Chicago	11.50-12.00
Eastern Pa.	12.50-13.00
New York, dealer	7.50- 8.00
St. Louis	10.75-11.25

LOCOMOTIVE TIRES ☐

Chicago (cut)	11.50-12.00
St. Louis, No. 1	10.00-10.50

LOW PHOS. PUNCHINGS ☐

Buffalo	13.25-13.75
Chicago	12.50-13.00
Eastern Pa.	14.50-15.00
Pittsburgh	14.50-15.00

Iron Ore

Lake Superior Ore

Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.80
Mesabi nonbess.	4.50
High phosphorus	4.40
Mesabi bessemer	4.65
Old range nonbes.	4.65

Eastern Local Ores

Cents, unit, del. E. Pa.

Foundry and basic 56-63% con. (nom.)	8.00- 9.00
Cop.-free low phos. 58-60% (nom.)	10.00-10.50

Foreign Ore

Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.	10.00
No. Afr. & low phos.	9.50
Swedish basic, 65%	9.00
Swedish low phos.	9.50
Spanish No. Africa basic, 50 to 60%	9.00
Tungsten, spot, sh. ton unit, duty pd.	$17.75-18.25
N. F. fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$19.00-19.50

Manganese Ore

(Nominal)

Prices not including duty, cents per unit cargo lots.

Caucasian, 52-55%	26.00
So. African, 52%	26.00
So. Afr., 49-51%	24.00
Indian, 58-50%	nominal
Indian, 48-50%	nominal

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS	
Baltimore*	2.90c
Boston††	2.95c
Buffalo	3.00c
Chattanooga	3.31c
Chicago	2.95c
Cincinnati	3.15c
Cleveland	2.95c
Detroit	3.03½c
Houston	3.00c
Los Angeles	3.70c
Milwaukee	3.06c
New Orleans	3.30c
New York‡(d)	3.22c
Pittsburgh(h)	2.90c
Philadelphia*	2.90c
San Francisco	3.60c
Seattle	3.60c
St. Louis	3.19c
St. Paul	3.00c
Tulsa	3.25c
IRON BARS	
Portland	3.40c
Chattanooga	3.31c
Baltimore*	3.00c
Chicago	2.75c
Cincinnati	3.15c
New York‡(d)	3.32c
Philadelphia*	2.90c
St. Louis	3.19c
Tulsa	3.25c
REINFORCING BARS	
Buffalo	2.60c
Chattanooga	3.31c
Chicago	2.10c-2.60c
Cleveland (c)	2.10c
Cincinnati	3.25c
Houston	3.25c
Los Ang., cl	2.15c
New Orleans	3.50c
Pitts., plain (h)	3.05c
Pitts., twisted squares (h)	3.175c
San Francisco	2.45c
Seattle	3.50c
St. Louis	3.24c
Tulsa	3.25c
Young.	2.30c-2.60c
SHAPES	
Baltimore*	2.95c
Boston††	3.17c
Buffalo	3.25c
Chattanooga	3.56c
Chicago	3.20c
Cincinnati	3.40c
Cleveland	3.31c
Detroit	3.40c
Houston	3.00c
Los Angeles	3.70c
Milwaukee	3.31c
New Orleans	3.55c
New York(d)	3.37c
Philadelphia*	2.95c
Pittsburgh(h)	3.15c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.44c
St. Paul	3.25c
Tulsa	3.50c
PLATES	
Baltimore*	2.95c
Boston††	3.18c
Buffalo	3.37c
Chattanooga	3.56c
Chicago	3.20c
Cincinnati	3.40c
Cleveland, ¼-in. and over	3.31c
Detroit	3.40c
Detroit, 3/16-in.	3.65c
Houston	3.00c
Los Angeles	3.70c
Milwaukee	3.31c
New Orleans	3.55c
New York(d)	3.40c
Philadelphia*	2.95c
Phila. floor	4.95c
Pittsburgh(h)	3.15c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.44c
St. Paul	3.25c
Tulsa	3.50c
NO. 10 BLUE	
Baltimore*	3.05c
Boston††	3.25c
Buffalo	3.62c
Chattanooga	3.36c
Chicago	3.05c
Cincinnati	3.20c
Cleveland	3.11c
Det., 8-10 ga.	3.13½c
Houston	3.35c
Los Angeles	3.80c
Milwaukee	3.16c
New Orleans	3.55c
New York	3.27c
Portland	3.75c
Philadelphia*	3.05c
Pittsburgh(h)	2.95c
San Francisco	3.75c
Seattle	3.75c
St. Louis	3.29c
St. Paul	3.45c
Tulsa	3.70c
NO. 24 BLACK	
Baltimore*†	3.51c
Boston (g)	3.90c
Buffalo	3.25c
Chattanooga	4.21c
Chicago	3.85c
Cincinnati	4.05c
Cleveland	3.91c
Detroit	3.98½c
Los Angeles	4.45c
Milwaukee	3.96c
New York	3.85c
Philadelphia*†	3.55c
Pitts.** (h)	3.55c
Portland	4.40c
San Francisco	4.40c
Seattle	4.40c
St. Louis	4.09c
St. Paul	3.695c
Tulsa	4.75c
NO. 24 GALV. SHEETS	
Baltimore*†	4.21c
Buffalo	4.00c
Boston (g)	4.60c
Chattanooga	4.86c
Chicago (h)	4.55c
Cincinnati	4.70c
Cleveland	4.61c
Detroit	4.70c
Houston	4.40c
Los Angeles	5.05c
Milwaukee	4.66c
New Orleans	4.95c
New York	4.50c
Philadelphia*†	4.25c
Pitts.** (h)	4.15-4.45c
Portland	5.00c
San Francisco	5.00c
Seattle	5.00c
St. Louis	4.79c
St. Paul	4.19c
Tulsa	5.10c
BANDS	
Baltimore*	3.15c
Boston††	3.25c
Buffalo	3.42c
Chattanooga	3.61c
Chicago	3.30c
Cincinnati	3.45c
Cleveland	3.36c
Detroit, ⅜-in. and lighter	3.38½c
Houston	3.25c
Los Angeles	3.90c
Milwaukee	3.41c
New Orleans	3.95c
New York(d)	3.62c
Philadelphia	3.15c
Pittsburgh(h)	3.20c
Portland	3.90c
San Francisco	4.05c
Seattle	3.90c
St. Louis	3.54c
St. Paul	3.20c
Tulsa	3.45c
HOOPS	
Baltimore	2.30c
Boston	4.25c
Buffalo	3.42c
Chicago	3.30c
Cincinnati	3.45c
Det., No. 14 and lighter	3.38½c
Milwaukee	3.41c
New York	3.62c
Philadelphia	3.40c
Pittsburgh(h)	3.70c
Seattle	5.60c
St. Louis	3.54c
St. Paul	3.75c
COLD. FIN. STEEL	
Baltimore (c)	3.71c
Boston	3.85c-4.00c
Buffalo (h)	3.55c
Chattanooga*	4.06c
Chicago (h)	3.50c
Cincinnati	3.70c
Cleveland (h)	3.50c
Detroit	3.63½c
Los Ang.(f)(d)	4.95c
Milwaukee	3.61c
New Orleans	4.30c
New York	3.92c-4.42c
Philadelphia	3.73c
Pittsburgh(h)	3.45c
Portland (f)	4.75c
San Fran.(f)(d)	5.95c
Seattle(f) (d)	4.75c
St. Louis	3.74c
St. Paul	3.20c
Tulsa	4.65c
COLD ROLLED STRIP	
Boston, 0.100-in., 500 lb. lots	5.35c
Buffalo	3.39c
Chicago	3.27c
Cincinnati(b)	3.42c
Cleveland (b)	3.20c
Detroit	3.33c
New York	4.70c
St. Louis	3.36c

TOOL STEELS

(Applying on or east of Mississippi river; west of Mississippi 1c up)

	Base
High speed	57c
High carbon, high chrome	37c
Oil hardening	22c
Special tool	20c
Extra tool	17c
Regular tool	14c

Uniform extras apply

BOLTS AND NUTS

(100 pounds or over)

	Discount
Chicago (a)	70
Cleveland	70
Detroit	70
Milwaukee	70
Pittsburgh	70

(a) Under 100 pounds, 65 off.

(b) Plus straightening, cutting and quantity differentials; (c) Plus mill, size and quantity extras; (d) Minus quant. diff.; (e) New mill classif.; (f) Rounds only; (g) 50 bundles or over; (h) Outside delivery, 10c less.

‡Domestic bars; *Plus quan. extras; **Under 25 bundles; *†50 or more bundles; †New extras apply; ††Base 40,000 lbs. extras on less.

Prices on heavier lines are subject to new quantity differentials; 399 lbs. and less, up 50 cts.; 400 to 9999 lbs., base; 10,000 to 19,999 lbs., 15 cts. under; 20,000 to 39,999 lbs., 25 cts. under; 40,000 lbs. and over, 35 cts. under base.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, Feb. 28

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

	British gross tons U. K. ports £ s d	Continental Channel or North Sea ports, metric tons Quoted in dollars at current value	**Quoted in gold pounds sterling £ s d
PIG IRON			
Foundry, 2.50-3.00 Silicon	$14.91 3 1 6	$14.86	1 16 0
Basic bessemer	13.34 3 15 0*	13.20	1 12 0
Hematite, Phos. .03-.05	15.16 3 2 6	.....	.....
SEMIFINISHED STEEL			
Billets	$26.68 5 10 0	$19.38	2 7 0
Wire rods, No. 5 gage	37.83 7 16 0	37.13	4 10 0
FINISHED STEEL			
Standard rails	$37.59 7 15 0	$45.38	5 10 0
Merchant bars	1.63c 7 10 0	1.17c to 1.22c	3 2 6 to 3 5 0
Structural shapes	1.60c 7 7 6	1.15c	3 1 6
Plates, †¼ in. or 5 mm.	1.74c 8 0 0	1.54c	4 2 6
Sheets, black, 24 gage or 0.5 mm.	2.01c 9 5 0	2.17c	5 16 0††
Sheets, gal., 24 gage, corr.	2.44c 11 5 0	2.42c	6 10 0
Bands and strips	1.84c 8 10 0	1.49c	4 0 0
Plain wire, base	2.01c 9 5 0	2.00c	5 7 6
Galvanized wire, base	2.44c 11 5 0	2.34c to 2.37c	6 5 6 to 6 7 6
Wire nails, base	2.60c 12 0 0	2.15c	5 15 0
Tin plate, box 108 lbs.	$4.37 0 18 2	.....	.....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d $(43.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

	L s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5	$16.37	3 7 6(a)	$17.29	260	$14.57	310	$25.52	63
Basic bessemer pig iron	16.37	3 7 6(a)*	12.30	185	13.40	285	28.15	(b)69.50
Furnace coke	4.24	0 17 6	7.98	120	5.17	110	7.70	19
Billets	26.68	5 10 0	28.59	430	20.68	440	39.08	96.50
Standard rails	1.79c	8 5 0	2.08c	694	2.31c	1,100	2.43c	132
Merchant bars	1.87c	8 12 0	1.68c	560	1.16c	550	2.02c	110
Structural shapes	1.90c	8 15 0	1.65c	550	1.16c	550	1.98c	107.50
Plates, †¼-in. or 5 mm.	1.97c	9 1 3	2.10c	700	1.47c	700	2.34c	127
Sheets, black	2.28c	10 10 0§	2.55c	850‡	1.63c	775‡	2.65c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	2.82c	13 0 0	4.05c	1,350	3.15c	1,500	6.81c	370
Plain wire	2.01c	9 5 0	3.15c	1,050	2.31c	1,100	3.18c	173
Bands and strips	2.03c	9 7 0	1.95c	650	1.47c	700	2.34c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel a del. Middlesbrough. b hematite †† Close annealed

**Gold pound sterling carries a premium of 69.41 per cent over paper sterling.

Bars

Bar Prices, Page 78

Pittsburgh — Although soft steel bar buying has slackened somewhat the past three weeks, activity holds well compared with plates and structural shapes. One apparent change in automotive specifications for bar mill products in both carbon and alloy grades is in absence of insistence for rush deliveries. At 1.80c, Pittsburgh, carbon steel bars are firm and unchanged, as are alloy bars at 2.45c, Pittsburgh.

Cleveland—Daily average merchant steel bar production here in February at 58 per cent was practically unchanged from the January rate. Shipments are expected to hold the present level through March, three-fourths of the output going to automobile interests. Alloy steel bar mills are booked for all they can ship through March. Agricultural implement manufacturers continue to place fairly large orders for steel bars; included during the week was one for 200 tons. The volume of miscellaneous orders has declined moderately.

Chicago — Steel bar demand is steadier. Consumption is holding well in practically all industries, with miscellaneous users contributing an even volume of business. Bar producers have been able to give fairly prompt delivery the past two months, hence the carryover of unshipped business next quarter is expected to be light. Books are open for second quarter at unchanged prices.

Boston—Bar demand is unchanged, but generally holding, notably cold-finished and forging requirements. Several larger consumers of bars are buying sparingly, including railroads and bolt and nut makers. Machinery builders are taking in small lots, often from jobbers.

New York—Buying of steel bars is maintained with books opened for second quarter at unchanged prices. Prices of imported bars, plates and shapes have weakened and have been offered here as low as 1.85c, delivered. Some jobbers have threatened to lay in some of this material.

Philadelphia — Bar requirements of cold-drawn producers continue brisk, and the recently noted improvement in jobbers' specifications is still in evidence. Railroad buying is light and, in general, the volume of demand leaves much to be desired. Producers have opened books for second quarter at the unchanged figure of 1.80c, Pittsburgh, or 2.09c, Philadelphia.

United Engineering & Foundry Co., Pittsburgh, is extending its home offices in the First National Bank building, Pittsburgh, by renting an additional floor to accommodate extra engineers and draftsmen.

Plates

Plate Prices, Page 78

Pittsburgh — McClintic-Marshall Corp., Bethlehem, Pa., bidding $22,963.42, Leetsdale, Pa., on 280 28-inch inside diameter land pipe lengths, of ½-inch plates, is low on Feb. 21 bids to the Kansas City army engineers. The land pipe, with 560 connecting links, is for shipment to Wiota, Mont. Tank makers report practically no business of size and railroad plate buying is inconsequential. The market is steady on the basis of 1.80c, Pittsburgh. Plate deliveries are obtainable within a few days. American Bridge Co., Pittsburgh, is low on a riveted basis and McClintic-Marshall Corp. on a welded basis for seven small needle flats requiring about 100 tons of plates on Feb. 28 bids to army engineers there.

Cleveland—Few orders for plates are for more than carload lots and the market appears quieter. Boiler manufacturers and beer tank fabricators have made some fairly good purchases. The Louisville & Nashville is inquiring for about 2000 tons of plates, shapes and bars for repair work, and lake freight vessel repair jobs this spring may take 2000 tons. Arthur G. McKee & Co., Cleveland, has taken 175 tons of plates, shapes and bars for an Asiatic Petroleum Co. project in Java, East Indies.

Chicago — Despite a moderate gain in plate demand from miscellaneous consumers, orders and shipments continue relatively light. Railroads and railroad equipment builders have shown small increase and tank work also is quiet. An irrigation project in Nebraska will take 400 tons of plates.

Boston — Plate buying is mainly in small miscellaneous lots. Fabricators have small backlogs and are buying as needed for limited incoming business. Large tank and fabricated pipe requiring plates is lacking. Slight gains for industrial requirements have been held. Plates for next quarter will be 2.20c, Boston.

New York — Following several weeks of dullness platemakers expect a sharp improvement in tank work this month, with various projects in prospect. New York state is inquiring for two tanks for Poughkeepsie, N. Y., requiring 250 tons. McClintic-Marshall Corp., Bethlehem, Pa., has booked a fair tonnage for a tank for Gulf Refining Co. Sun Oil Co., Philadelphia, has several tanks up for erection in various parts of the country.

Philadelphia — Plate buying continues restricted to small lots, with close to 500 tons for the Erie ferry boat to be built by the Sun Shipbuilding Co., Chester, Pa., noted last week, the most active inquiry noted. The Wilmington, Del., yards of the Dravo Contracting Co., will build two coal barges for the Pennsylvania railroad, but it is understood that plain material is being purchased at the company's headquarters in Pittsburgh. Tank fabricators here are figuring on two cracking unit projects, involving 330 tons. Railroad and construction requirements are negligible. Plates are steady at 1.90c, Coatesville, Pa., or 1.98½c, Philadelphia.

Cincinnati — Shipment was made during the past week of 600 tons of fabricated plates and structural steel, with about 480 tons of the total in plates, by Stacey Brothers Gas Construction Co., Cincinnati, to Puckow, China. The steel is for two gas storage tanks, part of a proposed atmospheric nitrogen plant for the Youngli Chemical Co. The order involves about $100,000, the local firm to provide a supervising crew.

San Francisco—Demand for steel shows no further improvement and few projects of importance are pending. Western Pipe & Steel Co. took 100 tons for two tanks for Belmont, Calif. Bids open next week on 1500 tons for the Hetch Hetchy bay crossing pipe line. Long Beach will take on six tanks, involving several hundred tons. The Petrol Corp., Los Angeles, will take bids on four tanks with capacity of 85,000 barrels.

Contracts Placed

450 tons, tank tops, for Columbia Transportation Co., Cleveland, to Jones & Laughlin Steel Corp., Pittsburgh.

375 tons, tanks, Shawano, Wis., to Pittsburgh-Des Moines Steel Co., Pittsburgh.

225 tons, for large diameter pipe line, New Brunswick, N. J., to Jones & Laughlin Steel Corp., Pittsburgh, through Alco Products Inc., New York.

120 tons, 12 filter tanks, Passaic Valley water commission, Little Falls, N. J., to Paterson Boiler & Tank Co., Paterson, N. J.

100 tons, two tanks, Belmont, Calif., to Western Pipe & Steel Co., San Francisco.

Contracts Pending

400 tons, irrigation project, Platte Valley Public Power Co., Paxton, Nebr.

300 tons, estimated, two coal barges, Pennsylvania railroad, awarded to Dravo Contracting Co., Pittsburgh, for construction at its yards in Wilmington, Del.

180 tons, cracking unit, Shell Refining Co., Wood River, Ill.; pending.

150 tons, cracking stills, Atlantic Refining Co., Philadelphia; pending.

100 tons, seven needle flats, for Pittsburgh army engineers; four for Pitts-

burgh delivery and three for Cincinnati delivery. American Bridge Co., Pittsburgh, low on riveted basis and McClintic-Marshall Corp., Bethlehem, Pa., low on a welded basis, on bids of Feb. 28.

Unstated tonnage, two steel dump scows, each 122 x 32 x 7 feet, for delivery to Grand Haven, Mich.; bids to Milwaukee army engineers, March 13.

Sheets

Sheet Prices, Page 78

Pittsburgh — Numerous orders from steel shelving and locker manufacturers, as well as electrical refrigerator concerns and farm implement makers have been an encouraging development in the sheet market. This comes at a time when releases on full-finished sheets for the automotive industry have diminished. However, on the latter grades, producers still are considerably in arrears on deliveries and should begin soon to make early second quarter shipping schedules. All sheet prices have been extended for second quarter.

Cleveland — Demand for sheets continues strong. Automobile manufacturers have contracted for a considerable portion of their second quarter requirements. The Cleveland and adjacent lake mills are operating at capacity, and specifications already in hand assure schedules close to this rate as far ahead as April 15, barring labor troubles at consuming plants. No delays have been encountered so far. The principal needs from other industries are for enameling stock used in household equipment.

Chicago—Sheet producers expect to continue active operations during March and will be forced to carry over into second quarter a fairly large tonnage of material which they will have been unable to ship during this quarter. Such tonnage constitutes most of the business in immediate prospect for April delivery, though books have been opened only a short time for second quarter. Consumption in leading industries is holding well and no slackening in automotive requirements is anticipated for another six weeks. New business lately has been curtailed by the fact that mills were unable to accept orders for delivery before April. Prices for second quarter are unchanged from recent levels.

Boston—Sheet sellers look to jobbers for slightly heavier volume this month for early shipment next quarter. Meanwhile miscellaneous demand holds well with small tank and container consumers releasing fair shipments.

New York—Heavy orders for cold-finished sheets marked the opening of producers' books for second quarter. While there is little direct automotive demand in this district, consumers of cold-finished sheets in other lines placed substantial contracts in their effort to compete with the mid-western automobile interests for early position on mill rolling schedules. Refrigerator, furniture and makers of certain other lines were particularly active. Hot rolled products were a different story, with orders coming out slowly. Prices are unchanged.

Philadelphia—Placing of orders by autobody builders here for second quarter features the sheet market. These consumers are acting promptly in an effort to obtain preferred schedules. Orders from other sources are coming through more slowly, although general specifications are holding up fairly well. Jobbers are specifying galvanized sheets more freely.

Washington—The Berger Mfg. Co., Canton, O., has been awarded sheet metal partitions for the United States Archives building, Washington, at $545,220. A large tonnage of sheets will be used.

Buffalo—No slackening has appeared thus far in demand for sheets, production here continuing at 70 to 75 per cent.

Cincinnati — Sheet mills have opened books for the second quarter, finding a demand which indicates production near capacity at least for the first few weeks. The principal interest, by maintaining schedules at about 90 per cent, will be enabled to make deliveries on all first quarter purchases. Refrigerator manufacturers, and jobbers are more active in the market. Prices on rejects and wasters for delivery after April 1 are up $2 to $8 a ton.

St. Louis—Improvement in sheet demand, noted during the past several weeks, has gained momentum. Preliminary reports indicate that February volume was the largest for the month since 1931, and specifications and new orders for March shipment insure a continuance of the rate through that period. Demands are diversified.

Cold Finished

Cold Finished Prices, Page 79

Pittsburgh—No marked change occurred in the cold-finished bar market last week with the market for second quarter unchanged at 2.10c, base Pittsburgh, for carbon cold-drawn material and 2.95c, Pittsburgh, for alloy grades. With no price change in prospect no speculative buying is expected to develop through March.

Transportation

Track Material Prices, Page 79

New York Central opened bids under the Clayton law March 1 on 20,000 tons of rails and the Erie is expected to inquire shortly for a similar tonnage. The Virginian has awarded 2200 tons of rails to Bethlehem Steel Co., Bethlehem, Pa. Southern has distributed 1000 tons of fastenings to eastern makers.

Louisville & Nashville is inquiring for 2000 tons of steel for repair work, including plates, shapes and bars. Southern Pacific, San Francisco, has divided track bolts and spikes for its recent purchase of 26,000 tons of rails between Colorado Fuel & Iron Co., Denver, and Pacific Coast Steel Corp., San Francisco.

Delaware river bridge commission, Philadelphia, will take bids March 15 on 26 electric passenger coaches for use on the bridge. Chicago, Burlington & Quincy is building one locomotive in its own shops and plans construction of 500 composite coal cars in its shops.

Buses Placed

Carolina Coaches, Charlotte, N. C., four 33-passenger intercity coaches, to White Motor Co., Cleveland.

Chicago Motor Coach Co., Chicago, 30 single deck coaches to General Motors Truck Co., Pontiac, Mich.

East Bay Street Railway Ltd., Oakland, Calif., 10 thirty-passenger, to Twin Coach Corp., Kent, O.

Kansas City Public Service Co., Kansas City, 31 thirty-passenger, to Twin Coach Corp., Kent, O.

Monumental lines, Baltimore, five 32-passenger city coaches, to White Motor Co., Cleveland.

New Orleans Public Service Co., New Orleans, seven 30-passenger, to Twin Coach Corp., Kent, O.

Southwest Missouri Railroad Co., three 24-passenger, to Twin Coach Corp., Kent, O.

Washington, Virginia & Maryland Coach Co., Clarendon, Va., one 37-passenger, five 23-passenger one 30-passenger, to Twin Coach Corp., Kent, O.

Z. & M. Coach Co., New York, ten 38-passenger city coaches, to White Motor Co., Cleveland.

Rail Orders Placed

Virginian, 2200 tons, to Bethlehem Steel Co., Bethlehem, Pa.

Bangor & Aroostook, 1000 tons, to Carnegie Steel Co., Pittsburgh.

Car Orders Pending

Delaware river bridge commission, Philadelphia, 26 passenger coaches; bids March 15.

Locomotives Pending

Bureau of supplies and accounts, navy department, one diesel-electric switching locomotive, Hingham, Mass., and one Portsmouth, N. H.; bids March 8.

Louisiana & Arkansas, four locomotives; bids asked.

Pipe

Pipe Prices, Page 79

Pittsburgh—Bids on the 88-mile pipeline in California for General Petroleum Corp., Los Angeles, have been received, but late Friday no award had been made, although it is expected the tonnage will be divided among several producers. About 9250 tons of 10¾-inch seamless line pipe is required.

Sharon Tube Co., Sharon, Pa., resumed Feb. 25 on an operating schedule after some weeks of idleness.

Cleveland—Steel pipe purchases for various industrial purposes are fairly active, but tonnage is relatively light. Elyria, O., is inquiring for 1100 tons of 30-inch cast pipe for a watermain, financed by PWA.

Chicago — Cast pipe orders of about 1500 tons are headed by 800 tons for Evanston, Ill. Bids close this week on 3258 tons of large diameter pipe for Chicago. While the market still is relatively quiet, the fact that a fairly large number of inquiries is pending and in prospect points to a gradual pickup in buying over the next several months. Prices are steady.

Boston — Although a fair volume of cast pipe is required for work planned this spring, definite inquiries have been slow to come out. The Beverly-Salem water project is expected to take additional cast pipe this year. Demand and inquiry for steel pipe is limited largely to heating contracts and replacements.

New York—Delay in award of general contracts continues to hold up award of close to 3000 tons of cast pipe and practically as much steel pipe for New York city water line projects on which bids are in. Torrington, Conn., is in the market for about 500 tons of 24-inch. Buying is light, as is inquiry, with the exception of New York city requirements.

San Francisco — Although awards of cast iron pipe are not heavy, a fair tonnage is pending and most of it probably will be placed during the next week or two. Bids open March 6 for the San Francisco bay crossing pipeline for the Hetch Hetchy project which will require several hundred tons. An outfall sewer for Los Angeles, up for bids soon, will require 5630 feet of 60-inch pipe. Movement of oil country goods is brisk.

Seattle — Small tonnages predominate as the larger projects are developing slowly. The week's awards were not important. Contract for the Veradale project, near Spokane, originally involving 472 tons of steel pipe, 3½ to 8-inch has gone partially wood and the steel awarded is unstated.

Cast Pipe Placed

800 tons, 16-inch, Evanston, Ill., to Glamorgan Pipe & Foundry Co., Lynchburg, Va.

375 tons, Adams, Wis., to James B. Clow & Sons, Chicago; previously reported as 150 tons.

375 tons, Colchester, Ill., to James B. Clow & Sons, Chicago.

324 tons, 4 to 8-inch, class 150, Belmont, Calif., to American Cast Iron Pipe Co., Birmingham, Ala.

235 tons, Dallas, Tex., to American Cast Iron Pipe Co., Birmingham, Ala.

145 tons, filtration plant, Saratoga, N. Y., to Warren Foundry & Pipe Co., Phillipsburg, N. J.; F. H. Magraw & Co., New York, general contractor.

133 tons, 4 to 12-inch, class 150, Santa Barbara, Calif., to American Cast Iron Pipe Co., Birmingham, Ala.

100 tons, Forrest, Ill., to James B. Clow & Sons, Chicago.

Cast Pipe Pending

1100 tons, 30-inch watermain, Elyria, O.; bids being taken.

500 tons, 24-inch and under, Torrington, Conn.; bids in.

325 tons, 6 and 8-inch, Newton, Mass.

250 tons, also fittings, Coney Island sewage disposal plant; P. Thomasetti Contracting Co., New York, low. Previous force main contract, 5400 feet of 24-inch, went reinforced concrete pipe.

111 tons, 6 and 8-inch, class 150, Beverly Hills, Calif.; bids in.

A DEEP DRAWING JOB OF EXTREME ACCURACY

A seamless steel shell with specially shaped nose — used as an exercise head for torpedo shell. Deep drawn from a solid plate of open hearth steel or aluminum, or phosphor bronze, and formed with extreme accuracy, this shape is an example of Hackney's ability in the field of special shapes, tanks and shells.

Completely seamless, deep drawn shell — for use in carburizing

Countless industries have found the Hackney deep drawing method an efficient and economical answer to their needs for shapes of various types. Cold drawing provides uniform thickness and temper, assures a smooth surface. Seamless construction saves weight and provides strength.

Hackney seamless, removable head bilged barrel — used in handling of many products

Send your blue prints or specifications for Hackney engineers to study—the Hackney service may prove of use to you.

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MILWAUKEE

DEEP DRAWN SHELLS AND SHAPES

Shapes

Structural Shape Prices, Page 78

New York—Award of approximately 2300 tons, one 1200-ton contract being tentative, leads structural steel activity. New inquiry is light, although there are more small projects active, including an increasing number of postoffices, most taking under 100 tons each. Shipments of fabricated structural steel in January were 56 per cent larger in volume than for the same month last year, although bookings showed a decline of 34 per cent for the same period, according to the American Institute of Steel Construction. Shipments in January were comparable with the average monthly shipments during 1934, but the bookings recorded a decrease of 41 per cent from the average for the first half, and were approximately 23 per cent less than for the last half of 1934. Tonnage available for fabrication is 23 per cent below 1934 last quarter average.

Pittsburgh—Bids have been postponed until March 8 on the 9000-ton, 11-story Library of Congress addition at Washington. This project has been difficult to estimate as fully 5000 tons of the total are in light gage steel for book racks. While fabricated structurals are weak, the 1.80c, Pittsburgh base on plain material is firm.

Cleveland—Featuring the market here, several steel piling jobs are up for figures, including 600 tons for a Wheeling & Lake Erie railroad dock in Huron, O., and 130 tons for a Pennsylvania railroad dock in Cleveland. The West Virginia Chlorine Products Co., Charlestown, is about to award 250 tons for extensions through the general contractor, H. K. Ferguson Co., Cleveland. Several hundred tons are up for bids March 8 to the Ohio state highway commission, Columbus. Manufacturers' purchases of small shapes for miscellaneous products have increased.

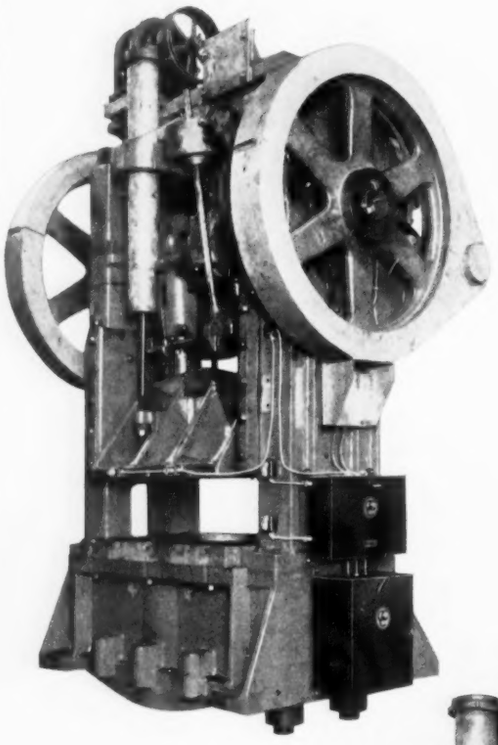
Chicago—Bids close March 14 on 2500 tons of shapes for the Ashland avenue bridge here. State highway bridges out for bids in Missouri, Oklahoma and Iowa involve about 1500 tons. Awards are few and include 2200 tons for a bridge at Ottumwa, Iowa. For a plant building for the Wander Co., Villa Park, Ill., 570 tons have been placed.

Boston—Structural steel is slightly more active in Connecticut, but in the aggregate shows little improvement in the New England territory, this being true of awards and inquiry. School requirements are up slightly, but bridge needs are light.

Philadelphia—Structural activity continues at low ebb, with a 125-ton award for a factory building in Camden, N. J., outstanding. Fabricators look for some improvement as weather becomes more favorable. Shape mills have opened books for second quarter at the unchanged price of 1.90c, Bethlehem, equivalent to 2.00½c, Philadelphia.

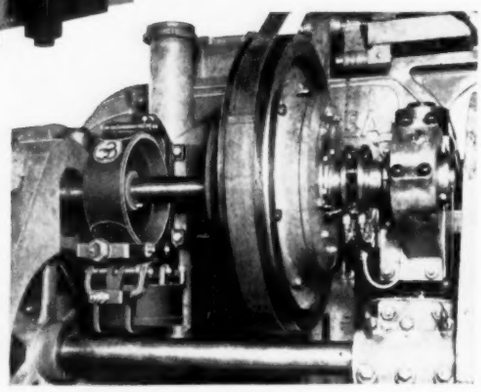
San Francisco—Structural shape awards during the week, 3177 tons, were the highest for any week so far this year. They included 800 tons for a gantry crane for the Mare Island, Calif., navy yard, placed with the

New Power Press Control Insures Safety



Safety to the operator is one of the main features of the automatic electric control operation of power presses developed by Clark Controller through the use of automatic control panel and electric brake. The power unit actually running the press has no connection with this control unit.

The safety feature is the non-repeat control system of operating the press. The installation illustrated is on a Niagara press although the same unit could be applied to any similar press. Patent pending.



Above illustration is complete view of press showing the automatic control panel while view at the right shows the electric brake unit.

THE CLARK CONTROLLER CO.
1146 East 152nd St.
Cleveland, Ohio

Shape Awards Compared

	Tons
Week ended March 2	11,321
Week ended Feb. 23	9,968
Week ended Feb. 16	12,535
This week in 1934	23,721
Weekly average, 1934	16,284
Weekly average, 1935	13,269
Weekly average, January	13,660
Total to date, 1934	172,359
Total to date, 1935	119,418

Star Iron & Steel Co., Tacoma, Wash. The Great Lakes Construction Co., Chicago, was low bidder on the general contract for a post office at Phoenix, Ariz., at $428,820. A combination of general contractors, headed by Utah Construction Co., were low bidders on the general contract for the Taylor Park dam in Colorado at $783,742, requiring 181 tons of shapes. Pending business now exceeds 12,000 tons.

Seattle—The only award of the week in excess of 100 tons went to Pacific Car & Foundry Co., Seattle, 230 tons for the state span at Ebey Slough, Wash. New projects of importance are lacking, business generally being slow.

Shape Contracts Placed

2200 tons, bridge, Ottumwa, Iowa, to Wisconsin Bridge & Iron Co., Milwaukee.

950 tons, high school, Bayonne, N. Y., to Bethlehem Fabricators Inc., Bethlehem, Pa.

916 tons, piling, state highway work, Ventura county, California, to unnamed interest.

800 tons, 40-ton gantry crane, specification 7855, Mare Island, Calif., navy yard, to Star Iron & Steel Co., Tacoma, Wash.

700 tons, bridge, Kalispell, Mont., to McClintic-Marshall Corp., Bethlehem, Pa.; previously reported to unnamed interest.

570 tons, plant building, Wander Co., Villa Park, Ill., to Joseph T. Ryerson & Son Inc., Chicago.

440 tons, two state highway bridges, Greensboro and Jackson, Ga., to McClintic-Marshall Corp., Bethlehem, Pa.

425 tons, approaches, Chelsea bridge, Boston, to McClintic-Marshall Corp., Bethlehem, Pa.

375 tons, state highway project 535-G, Vinings, Georgia, to American Bridge Co., Pittsburgh.

350 tons, Lafayette bridge, Norfolk, Va., to Hall-Hodges Co., that city; as recently noted 1290 tons of structural work for this project was awarded to the American Bridge Co., Pittsburgh.

300 tons, administration building, St. Joseph college, Hartford, Conn., to Standard Structural Steel Co., Hartford.

300 tons, garage, Brooklyn, N. Y., for the *Daily News*, to Ingalls Iron Works, Verona, Pa.

255 tons, public school No. 2, Queens, New York, to Lehigh Structural Steel Co., Allentown, Pa.

250 tons, Struthers bridge, Mahoning county, Ohio, to Lackawanna Steel Construction Corp., Buffalo.

230 tons, state bridge, Ebey Slough, Wash., to Pacific Car & Foundry Co., Seattle; West Coast Construction Co., Seattle, general contractor.

225 tons, state seawall, Ventura county, California, to unnamed interest.

215 tons, 11 transmission towers, Sheffield, Ala., for Tennessee valley authority, to Nashville Bridge Co., Nashville, Tenn.

210 tons, state highway project 1523, Lyons, Georgia, to Virginia Bridge & Iron Co., Roanoke, Va.

200 tons, coal pocket, Norfolk & Western railroad, Norfolk, Va., to Hall-Hodges Co., that city.

200 tons, academic building, Franklin junior high school, Long Beach, Calif., to unnamed interest.

190 tons, bridge 1036, Jennings county, Indiana, to Brookville Bridge Co., Brookville, O.

160 tons, two state highway bridges, Metter and Elco, Ga., to Virginia Bridge & Iron Co., Roanoke, Va.

160 tons, Ogden street bridge, Newark, N. J., for Delaware, Lackawanna & Western railroad, to Phoenix Bridge Co., Phoenixville, Pa.

155 tons, fabricated material for bridges, delivered Newark, N. J., Delaware, Lackawanna & Western railroad, to Phoenix Bridge Co., Phoenixville, Pa.

150 tons, bulkhead gates, specification 648-D, Boulder dam, Boulder City, Nev., to Mississippi Valley Structural Steel Co., St. Louis.

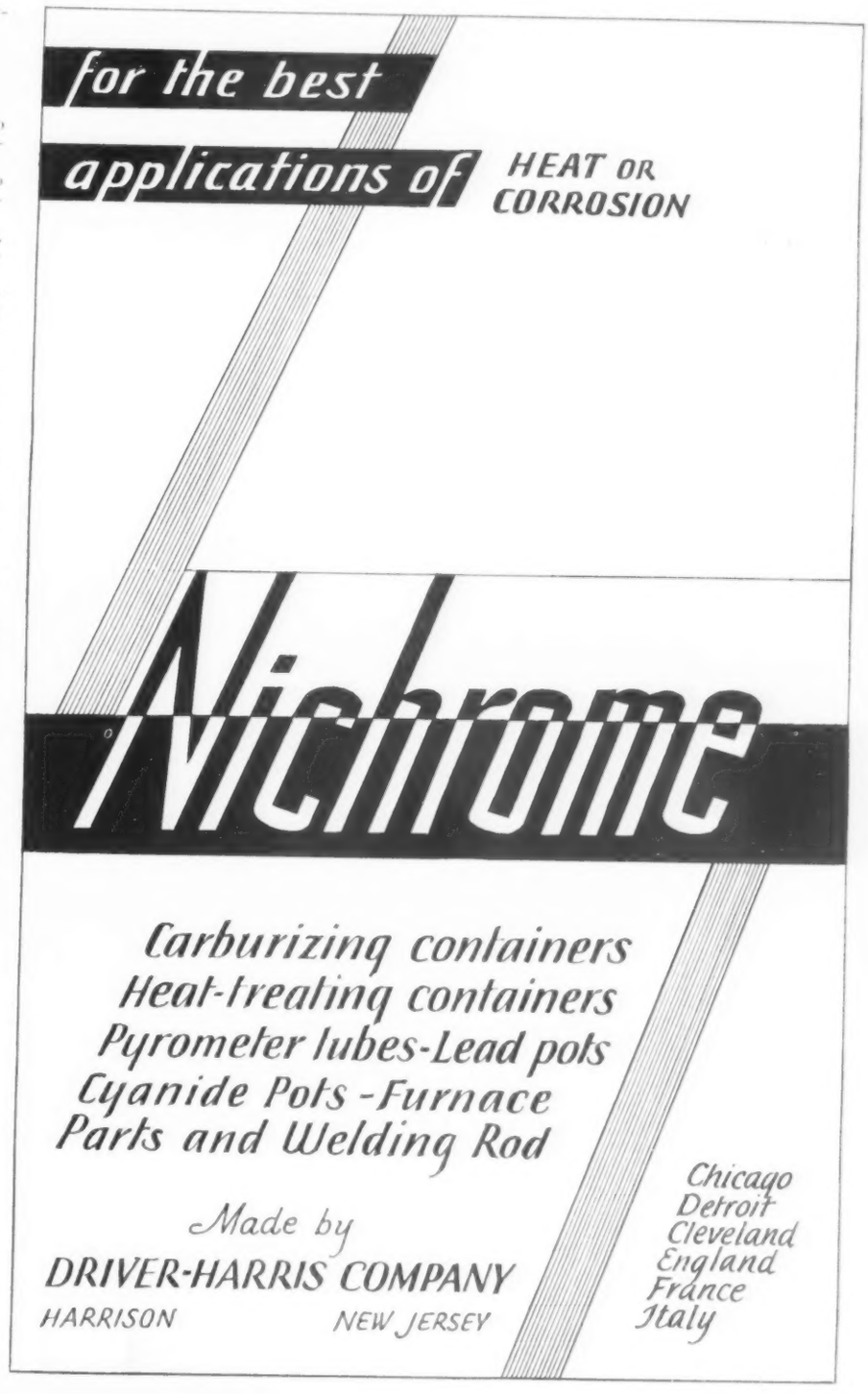
145 tons, school, DeRuyter, N. Y., to Smith & Caffrey Co., Syracuse, N. Y.; Kirkpatrick & Chappell, Binghamton, N. Y., general contractors. Kalman Steel awarded reinforcing bars.

145 tons, Penn-Greyhound bus terminal, Washington, to Barber & Ross Inc., Washington.

130 tons, factory building, Thomas Gibson Co., Camden, N. J., to Morris-Wheeler & Co., Philadelphia.

130 tons, sheet piling, Pennsylvania railroad dock, Cleveland, to Jones & Laughlin Steel Corp., Bethlehem, Pa.

125 tons, plant for Amalgamated Sugar Co., Clarksburg, Calif., to Palm Bridge & Iron Works, Sacramento, Calif.



115 tons, state highway project 1002-B, Metter, Ga., to Virginia Bridge & Iron Co., Roanoke, Va. Similar tonnage for project 1002-B to same fabricator announced Feb. 25.

165 tons, bridge, Eastern avenue, Washington, to McClintic-Marshall Corp., Bethlehem, Pa.

100 tons, alteration to Thomas A. Edison junior high school, Los Angeles, to Consolidated Steel Corp., Los Angeles.

100 tons, addition to Fibreboard Product Co. plant, South Gate, Calif., to Consolidated Steel Corp., Los Angeles.

Unstated, state bridge Whitman county, Washington; G. D. Lyon, Spokane, general contractor.

Shape Contracts Pending

9025 tons, including structural steel, sheet piling and miscellaneous metals, dam No. 26, Mississippi river, opposite Alton, Ill.; bids April 1 to United States engineer, St. Louis.

9000 tons, Library of Congress extension; bids postponed until March 8.

2500 tons, Ashland avenue bridge, Chicago; bids to commissioner of public works, March 14.

1400 tons, bridge over Clinch river, New Tazewell, Tenn., for Tennessee valley authority, Knoxville, Tenn.

1400 tons, grade crossing, Long Island railroad, St. Albans, New York; Faircroft Engineering Co., low.

800 tons, postoffice, Phoenix, Ariz.; Great Lakes Construction Co., Chicago, low on general contract at $428,820.

675 tons, state highway bridges, Missouri.

650 tons, state highway bridges, Missouri; bids in March 2.

600 tons, piling, dock at Huron, O., for Wheeling & Lake Erie railroad, Cleveland; bids March 6.

550 tons, high school, Cumberland, Md.; bids March 15.

450 tons, auditorium, Fresno, Calif.; Dinwiddie Construction Co., San Francisco, low on general contract.

400 tons, irrigation project, Platte Valley Public Power Co., Paxton, Nebr.

375 tons, state highway bridges, Iowa.

390 tons, state highway bridge, Addington, Okla.

350 tons, addition, public school 225, New York; bids in.

305 tons, blower building, easterly sewage disposal plant, Cleveland; Hunkin, Conkey Construction Co., low for general contract; Fort Pitt Bridge Works, Pittsburgh, low for steel. Project also includes 300 tons of reinforcing bars.

300 tons, chemistry building, Trinity college, Hartford, Conn.

250 tons, buildings for West Virginia Chlorine Products Co., Charlestown, W. Va.; H. K. Ferguson Co., Cleveland, general contractor.

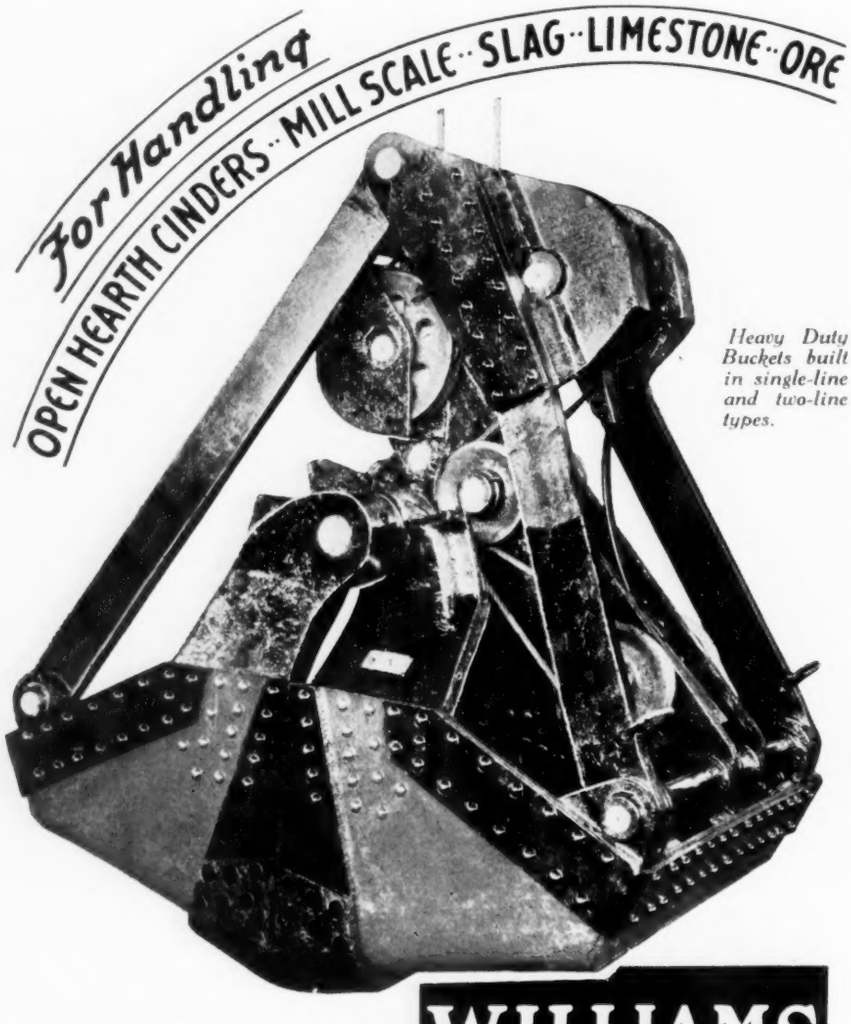
245 tons, hospital, Warms Springs, Mont.; bids March 4.

230 tons, Lowel junior high school, Long Beach, Calif.; bids rejected and new bids will be taken.

225 tons, state bridge, Bourne-Warehouse, Mass., C. T. Hosmer Co., Greenfield, Mass., low.

220 tons, state highway bridge, Newfane, N. Y.

200 tons, Scott township high school, Allegheny county, Pennsylvania; general contractor bids taken Feb. 28.



Heavy Duty Buckets built in single-line and two-line types.

We are the exclusive owners and builders of the widely endorsed Williams Buckets, sizes ranging from ½ to 16½ cu. yds. capacity.

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WELLMAN PRODUCTS INCLUDE: Steel Mill Equipment . . . Charging Machines, Cars and Boxes . . Manipulators . . . Coal and Ore Handling Bridges . . . Gantry Cranes . . . Special Cranes . . . Clamshell Buckets . . . Car Dumpers, all types . . . Blast Furnace Skip Hoists . . . Gas Producers, Flues . . . Gas Reversing Valves . . . Mining Machinery . . . Safety Stops for Traveling Structures . . . Welded Steel Construction . . . Castings and Machine Work to customers' drawings.

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ENGINEERS CONSTRUCTORS MANUFACTURERS
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Reinforcing

Reinforcing Bar Prices, Page 79

Pittsburgh — Work in the Muskingum, O., conservancy district still is an important outlet for reinforcing bars. Bids will be taken March 19 for the Mohawk dam near Warsaw, O., which requires 700 tons, and bids will be asked shortly thereafter for the Piedmont dam near Cambridge, O., which will require about 100 tons. In connection with relocation of the Pennsylvania railroad tracks near Mineral City, O., to the proposed Dover reservoir dam, it is estimated that 100 tons of reinforcing steel will be required. Bids on all these projects are being taken through the Zanesville, O., army engineers.

Cleveland—A Cleveland fabricator is expected to be awarded 300 tons of reinforcing bars for the easterly sewage disposal plant, on which Hunkin, Conkey Construction Co., this

city, is low bidder. Demand is limited almost entirely to public work. The Ohio highway commission will take bids March 8 on 330 tons for a road and bridge in Dublin village. Numerous small lots of road mesh are being purchased by nearby towns and counties.

Chicago — Concrete bar inquiries continue in fair volume in contrast to quietness in orders. Pending work has been increased by the appearance of several new projects, including 1600 tons for irrigation work in Nebraska. Orders remain to be placed on bars for filter plants in Milwaukee, Minneapolis and Michigan City, requirements for which involve nearly 10,000 tons. A building for the Olson Rug Co. here will take about 500 tons of bars.

Boston—Activity in reinforcing steel is largely in rail steel bars, the Boston district rolling mill having accumulated a fair backlog. A state highway at Cheshire, Mass., will take close to 170 tons of rail steel reinforcing.

New York—Purchase of approximately 1000 tons for an elevated highway and depressed track project, west side, Manhattan, features activity in reinforcing bars. New inquiry on which bids are in includes close to 625 tons for a sewage disposal project, Coney Island. Aggregate pending volume totals several thousand tons, including an increase in small-lot requirements.

Philadelphia—The market is dull. State work in Pennsylvania and New Jersey is not expected now for at least another month. In Norfolk, Va., two jobs, involving 550 tons, have been placed. Billet steel bars, cut lengths, are unchanged at 2.05c, Pittsburgh, or 2.34c, Philadelphia.

San Francisco—New inquiries are slow, but awards in the week totaled 4068 tons. Outstanding were 3335 tons for contract No. 15 and No. 15-A, San Francisco-Oakland bay bridge, placed with Soule Steel Co., San Francisco. Bids have been taken on 670 tons for the Marina high school, San Francisco. Bids on the White Point outfall sewer for Los Angeles will come up for figures soon, and more than 1600 tons of bars and shapes will be needed for tunnel work.

Seattle—The largest contract pending in this area calls for 350 tons for the state bridge at Ebey Slough, general contract awarded to West Coast Construction Co., Seattle, on a low bid of $306,128. Several construction jobs have been awarded, none calling for more than 100 tons. Salem, Oreg., has been allotted $360,000 PWA funds for an intercepting sewer system which will require a fair tonnage of reinforcing bars.

Concrete Awards Compared

	Tons
Week ended March 2	5,215
Week ended Feb. 23	13,776
Week ended Feb. 16	2,165
This week in 1934	4,524
Weekly average, 1934	4,084
Weekly average, 1935	5,457
Weekly average, January	3,898
Total to date, 1934	38,705
Total to date, 1935	48,112

Reinforcing Steel Awards

3335 tons, contract No. 15 and No. 15-A, San Francisco-Oakland bay bridge, San Francisco, to Soule Steel Co., San Francisco.

640 tons, west-side express highway, Seventy-second to Seventy-ninth street, New York, to Truscon Steel Co., Youngstown, O.; Poirier & McLane Corp., New York, general contractor.

325 tons, track depression, New York Central railroad, Fifty-fourth to Sixty-fourth street, west-side Manhattan, New York, to National Bridge Co., Long Island City, New York; Corbetta Construction Co., New York,

Our sheets must carry a better finish. Our rolls must, therefore, carry a better finish. There you have the unanimous decision of the steel industry.

Meeting this demand for better finish is the Landis Type 30 Roll Grinder. Not by accident but by well thought out design it is playing its part in the turning out of better sheets in more than one mill. Multiple V belt work drive, all electric control, a crowning and concaving mechanism that produces symmetrical contours and force feed lubrication to guide-ways and spindles are only some of the features making for such satisfactory results.

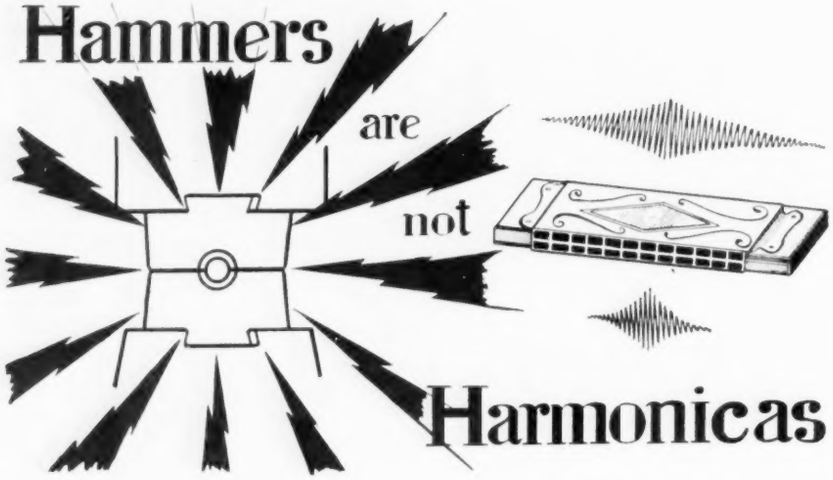
If you are striving for better roll finishes but are not getting them turn to the Landis Type 30. If your present Roll Grinder capacity is over-taxed turn to the Type 30 Landis. If you think we are too enthusiastic about this machine, at least ask us for a copy of catalog H-301. We suspect it will interest you more than just a little. 177

LANDIS TOOL CO.
WAYNESBORO, PA.

general contractor.
250 tons, building for Hollywood high school, Los Angeles, to unnamed interest.
230 tons, highways, Passaic and Somerset counties, New Jersey, to Stultz-Sickles Co., Newark, N. J.; through Lefera-Grecco Contracting Co.
150 tons, chapel, Calvary cemetery, Los Angeles, to unnamed interest.
150 tons, alterations to Thomas A. Edison junior high school, Los Angeles, to unnamed interest.
135 tons, bars and shapes, bridge, Oak Bluffs, Mass., to Bancroft & Nessco Co., Boston.

Reinforcing Steel Pending

1600 tons, irrigation project, Platte Valley Public Power Co., Paxton, Nebr.
1365 tons, dam No. 25, Mississippi river, opposite Alton, Ill.; bids April 1 to United States engineer, St. Louis.
700 tons, Mohawk dam near Warsaw, O.; bids March 19 to Zanesville, O., army engineers; dam to have 2330-foot length, 115-foot maximum height and top width of 35 feet.
670 tons, Marina junior high school, San Francisco; MacDonald & Kahn Co. Ltd., San Francisco, low on general contract.
600 tons, structures, Coney Island sewage disposal plant, New York, North-Eastern Construction Co., New York, low.
500 tons, plant building, Olson Rug Co., Chicago.
463 tons, auditorium, Fresno, Calif.; Dinwiddie Construction Co., San Francisco, low on general contract.
375 tons, highway projects, Texas; bids in Feb. 28.
350 tons, state bridge Ebey Slough, Wash.; general contract to West Coast Construction Co., Seattle.
330 tons, road and bridge work, Dublin, O.; bids to state highway commission, Columbus, March 8.
260 tons, Hall of Records, Fresno, Calif.; bids soon.
250 tons, grade crossing, Long Island railroad, St. Albans, New York, Faircroft Engineering Co., New York, low.
150 tons, postoffice, Phoenix, Ariz.; Great Lakes Construction Co., Chicago, low on general contract.
125 tons, highway bridges, Iowa.



THE purpose of Erie Drop Hammers is to create *shock**; therefore they are made of *shock-resisting* materials—principally forged steel and cast steel. They are designed not to vibrate**; the rigid box-section frames of Erie Hammers will not vibrate at any frequency met in forge-shop service.

The Charpy test is a standard means of measuring *shock-strength*. The Charpy value of the steel castings used in Erie Hammers has a guaranteed minimum of 9.0 ft. lbs. Compared to this, cast iron, semi-steel, or alloys whose base is cast iron, have a Charpy value practically zero,—too small and too erratic to read accurately, but certainly *less than 10%* of that of cast steel.

Hammers are not harmonicas; they must withstand *shock**, not vibration**. If you expect a hammer to hit a real blow—to hit like an Erie does—insist on materials of guaranteed *shock strength*.

**SHOCK:—A blow, impact, collision, concussion, or violent shake or jar; an abrupt, forcible onset.*

***VIBRATION:—A periodic motion of the particles of an elastic body, as when a stretched cord or other body produces musical tones, or particles of air transmit sounds to the ear.*

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ERIE, PENNA., U.S.A.

DETROIT: 335 Curtis Building
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Strip Steel

Strip Prices, Page 79

Pittsburgh — Strip steel has not undergone the setbacks experienced by other finished steel markets recently and many stamping and fabricating shops are still active buyers. Buyers are paying 1.80c, base Pittsburgh, for hot-rolled strip and 2.60c, Pittsburgh or Cleveland, as the cold-rolled strip base price.

Cleveland—Automobile manufacture is absorbing practically all the strip steel output here, mills continuing to operate at capacity. Demand for cold-rolled material is especially strong. These consumers have contracted March requirements and new orders are light.

Chicago — New business in strip steel is less active, due partly to the fact that until March 1 producers were unable to accept additional orders on certain grades for delivery this quarter. Mills will experience some difficulty in completing shipments of all tonnage booked this period, necessitating carrying over of some tonnage into April. Consumption is fairly steady, with automotive needs still expanding. Second quarter strip prices are unchanged from present levels.

Boston—Cold-rolled strip operations are being barely held, some plants experiencing a slight recession in demand. This is due to some decline in demand from makers of automobile accessories, who have material for several weeks.

New York—Movement of narrow strip is fair, but shows little change. Opening of books for second quarter resulted in little flurry in either narrow hot or cold-rolled strip, as prices were reaffirmed and there was little consuming pressure.

Philadelphia—While narrow cold-finished strip is more active than the hot-rolled product there is no great activity in either line. Sellers generally have opened books for second quarter unchanged at 2.89c, Philadelphia, for cold strip and 2.14c, for hot.

Wire

Wire Prices, Page 79

Pittsburgh — Unchanged prices on wire products for the second quarter have had a stabilizing effect on many classes of buyers, especially some mid-Western consumers of merchant items. Users of wire for manufacturing purposes are noticeably less frequent buyers, indicating inventories in some cases of both raw materials and finished products. The plain manufacturers' wire base is steady at 2.30c, Pittsburgh, for carload lots, and nails at $2.60 per keg.

Cleveland—Due to competition from mail-order houses, dealers and jobbers are slow to close with mills for wire, nails and fencing. Producers have had to contend with this situation for many months, but are holding their prices firmly and have extended them for second quarter. Some mail order houses are now understood to have cut prices to the extent of sales taxes. Mill operations and shipments are holding recent levels, however, due to continued good demand from the automobile industry.

Chicago—Steel wire sales and specifications have tapered moderately but shipments continue active and hold most of the gains accumulated so far this year. Automotive needs are expected to continue around their recent rate for several more weeks, while better demand for wire products is looked for next quarter. Demand from jobbers has shown little change recently, following slight improvement previously. Books now are open for second quarter at prices unchanged from recent levels.

Boston—Wire mill finishing operations are not materially changed in most departments. Buying has been for early delivery for some time and mills anticipate little difficulty in getting out first quarter business by the end of March. Reaffirming of prices has not materially affected specifications.

Philadelphia — Specifications for spring steel wire continue brisk, attributed largely to requirements of the automotive industry. Prices generally have been reaffirmed for second quarter.

Memphis, Tenn.—Bids close today, March 4 on 450 tons of bright drawn wire strand, delivery to the United States engineer, Memphis.

Tin Plate

Tin Plate Prices, Page 78

Pittsburgh—Tin plate production last week was steady at close to 80 per cent. Shipments have been comparable to this operating rate. Standard coke tin plate remains $5.25, per base box, and tin mill sizes of black sheets, 2.75c, Pittsburgh. American Sheet & Tin Plate Co.'s Laughlin works, Martins Ferry, O., went on capacity schedules beginning last week for the first time in over a year.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 59

Prices on nuts and bolts have been advanced five points, applying on spot and second quarter sales. This brings machine bolts to 70-10-5 off instead of 70-10-10 off previously.

Manufacturers have also reinstated the 10 per cent extra for less than full container quantities.

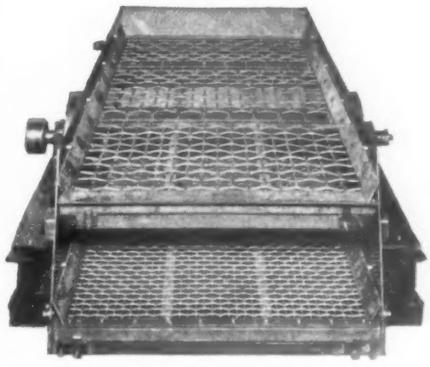
Manufacturers last week pointed to heavy financial losses in the industry. It does not have a code and keen competition has prevailed on the relatively light volume of business.

Demand in the Pittsburgh district is holding up well but has not passed the rate prevailing in January. At Cleveland specifications from the

BUFF-ALOY

High Abrasion Resisting

WIRE CLOTH



A brand new screen development, especially adapted for screening abrasive materials or particularly hard usage.

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automotive industry are holding recent levels but the market is dull otherwise. Railroad purchases are the lowest in months.

Large rivets are 2.90c, Pittsburgh and Cleveland; 3.00c, Chicago, and small rivets are 70-5 off list.

Pig Iron

Pig Iron Prices, Page 80

Pittsburgh—A few nonintegrated steel producers in this district continue to draw on old orders for basic pig iron. Announcement of unchanged prices for the second quarter naturally has not stimulated forward buying. Most local jobbing foundries recently have been able to operate but two to three days weekly at best, although radiator manufacturers are bettering this showing. Pig iron for ingot molds has fallen off, and the steel mill rollmakers report a similar situation.

Cleveland—Although general freight car loadings have fallen for three consecutive weeks, shipments of pig iron and foundry coke have continued to increase. For pig iron the daily average movement in the Great Lakes district in February was 20 per cent above that in January. Producers say their schedules indicate they will do better in March, barring unforeseen circumstances. The melt is increasing, and consumers are not stocking much material. Outside the motor car industry there is some fair, miscellaneous business. A leading lake interest here in the week booked 3000 tons during the week for prompt shipment.

Chicago—February pig iron movement extended the rise in monthly shipments which started last August. Indications point to a maintenance of recent activity in deliveries during March. Second quarter prospects are somewhat uncertain pending the appearance of new business during the current month. The outlook among automotive, farm implement and radiator foundries continues favorable, with some of these groups expected to increase operations during the next two months. Second quarter business now is being taken at $18.50, furnace, for No. 2 foundry and malleable.

Boston—Slight upturn in pig iron shipments is expected this month following reaffirming of prices for the second quarter. Buying has been light and in small lots, one brand of foreign iron moving at 50 cents a ton or more under domestic prices at Boston, apparently leading in sales. Larger consumers generally have stocks to last considerable time at present rate of melt, and the smaller foundries are buying close to requirements in small lots for quick delivery.

New York—Opening of books for second quarter by pig iron sellers here resulted in little improvement in the volume of orders. Business continues light, with consumers buying only for nearby requirements. As generally expected, prices were reaffirmed for next quarter.

Philadelphia—Pig iron producers have opened books for second quarter at unchanged prices and while there may be an increase in volume, they look for consumers to continue to buy largely on a hand-to-mouth basis. Some sellers recorded a slight gain in daily shipments for February.

Buffalo—Deliveries of iron are progressing steadily and orders are being taken out speedily by principal consumers. Purchases are of substantial variety and represent all classes of consumers. Five furnaces are in production with a sixth being relined prior to being placed in production.

Cincinnati—Furnace interests opened books March 1 for second quarter with only inquiries to indicate future demand. Bookings continued close to requirements for the current quarter and aggregated 1000 tons, with malleable moving proportionately most actively. Shipments hold to a steady level, reached in January. The agricultural implement melt is tending upward; the jobbing foundry melt generally remains spotty.

St. Louis—Preliminary reports indicate shipments of pig iron to melters in this district during February will represent the largest total for any single month in more than two years. The movement has continued the steady upward trend started early last fall, and the rate likely will continue high through March and April, business prospects for those months being good. The melt as a whole has expanded further. In the case of gray iron, relatively the best showing is made by specialty makers, notably stoves, farm implements and household appliances.

Birmingham, Ala.—With pig iron prices unchanged for the second quarter, producers are looking forward to heavier bookings. Republic Steel Corp. has added another furnace to those in operation in the district, making nine in all on basic and foundry iron.

Toronto, Ont.—Demand for merchant pig iron is slack, one reason being that stove foundries are not taking large tonnages of iron, but under present conditions are using sheets in building stoves. Prices are steady.

Scrap

Scrap Prices, Page 81

Pittsburgh — The effect of consuming mills withdrawing from the scrap market last week and a number of rejections, had the effect of weakening quotable prices. Centering around a 50-cent per ton reduction in heavy melting steel, the entire list recorded lower levels. Because of heavy mid-Western supplies, hydraulic compressed sheet scrap dropped $1 a ton, and machine shop turnings were weak at around $8 a ton. As an example of rejections, one down-river mill last week first rejected and then accepted at considerable discount, 30 carloads of No. 2 steel originating in the Kansas City district. The same shipper had 60 additional cars of No. 2 steel enroute. The same consumer also rejected seven barge loads of scrap consigned from Memphis, Tenn.

Cleveland—Softening of prices in other districts is reflected here by a drop of about 50 cents per ton on most grades. Consumer supplies are moderate but sufficient to inhibit buying. Holders of scrap are unwilling to sell but demand also is light. Prices in the Valley have also declined about 50 cents.

Chicago — With steelworks inclined to purchase scrap only for early needs, the market continues weak. Heavy melting steel has declined 50 cents on a sale of a moderate tonnage at $11, with the market now off $2 a ton from the year's high. While offerings are relatively light, they are more than offset by quiet in consumer buying. Railroads are offering only small lots and bids have been rejected in several instances on recent lists.

Boston—Export activity prevails in scrap buying, heavy melting steel bringing $9.25 and $8.25, docks, for the two grades. Two ships are loading. Domestic buying is light. Small lots of No. 1 cast bring $9 to $10 delivered at nearby points. Other cast grades are dull with some buying of No. 2 for export and breakable at $6 to $6.25 f.o.b. for Pennsylvania shipment. Turnings are weaker.

New York—The domestic scrap market is unsettled with buying light. Turnings have slumped sharply. Other grades are untested on domestic business. Export demand, however, tends to steady heavy melting steel, with dealers paying unchanged prices at dock. Smaller lots of cast and other grades being bought for export also tend to steady these prices.

Philadelphia—While softness still dominates the scrap market the only downward revision noted is in chemical borings. Domestic buying generally continues light, with some large consumers of steel scrap holding up shipments. No. 1 steel is $11 to $11.50, although the inside figure appears the more representative. No. 2 steel scrap, however, is firm. An easier tone exists on No. 1 steel for export, although a leading dealer continues to quote $10.50, wharf.

Buffalo — Wide ranges again prevail in scrap prices here. While some melters offer $10.50 to $11 for No. 1 heavy melting steel dealers claim the price is substantially higher and contend no tonnage can be bought at this price. There is still a good deal of $11.50 and $12 scrap to be delivered on orders. Melt is progressing at a rate which soon will clean up orders outstanding. Turnover of all grades has been halted temporarily until a going level of prices is established.

The Lackawanna buyer has closed on a sizable tonnage of No. 1 steel at $11, delivered. This follows a recent purchase of $11.50 and another, shortly prior to that, at $12. Incidentally, the $11 price is the same as that still being offered by Bethle-

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hem Steel Co. for tonnage for Sparrows Point, Md., the first time, in the recollection of some trade interests, that prices for these two points have been on a parity.

Detroit—As automobile manufacturers continue to offer scrap beyond the ability of the local district to absorb, especially considering that the Pittsburgh and Youngstown districts are virtually out of the market, prices have suffered again. Reductions this week are especially noticeable in the open-hearth grades. Heavy melting steel is now $8 to $8.50, with No. 1 busheling off to $7 to $7.50 and short shoveling turnings to $5.25 to $5.75.

Cincinnati — Several embargoes on shipments of iron and steel scrap and continued apathy toward new purchases have further weakened the market. Listed prices remain nominally unchanged. Dealers are covered on contracts and without much speculative buying, the market has turned decidedly duller.

St. Louis—Weakness of steel and iron scrap at eastern centers has been reflected here. Buying by melters is at a minimum, but shipments have been sufficient to absorb current offerings and there is no distress material. Prices are largely nominal, there being no transactions upon which to base accurate quotations. The only specific revision was a cut of 50 cents per ton in selected heavy melting steel.

Seattle—Exporters are firm, holding at last week's highs of $9.75 for No. 1 melting steel and $11.25 for rails. Japan is trying to shade the market but continues to purchase in fair volume. Local consumption is small, although foundry operations are slightly more active.

Birmingham, Ala. — Although scrap has not been moving in large lots, dealers are confident of improved conditions shortly.

Toronto, Ont.—Trading in iron and steel scrap shows slow but steady improvement. Current sales are mainly in steel grades, due to steady purchases by mills in the Hamilton and Montreal districts. Heavy melting steel is moving more freely while turnings are in small demand. Foundries continue to take iron grades in small lots for spot delivery. Dealers are out of the market, except for special grades and prices are unchanged.

Carrier Engineering Corp., Newark, N. J., has established an office in Los Angeles to cover 11 western states. Lambert H. Polderman, vice president, is district manager at the Los Angeles office.

Warehouse

Warehouse Prices, Page 82

Pittsburgh—Steel warehousemen here note little change from the January rate of specifications and shipments. Prices are firm.

Cleveland—Warehouses are losing considerable business, directly and indirectly, through strikes in metalworking plants and in others using equipment such as steel dies. Daily average tonnage booked in February was below that in January. Prices are unchanged.

Chicago—Sales from store were steady the past week, the volume ahead of the rate a year ago. Prices are unchanged.

New York—Daily average volume of warehouse sales during February compared favorably with the previous month. Buying is well spread as to products, including cold-finished, with increasing small orders predominating. Prices are steady and unchanged.

Philadelphia—While the daily average in February was slightly under that for January in the experience of most jobbers, these interests are looking forward to improvement this month, which normally is one of the best periods of the year. Prices are steady.

Detroit—Warehouse demand for iron and steel products opens March at substantially the same high rate of January, with prices steady and unchanged. The broad number of sources ordering is an encouraging factor.

Cincinnati — Warehouse business has been featured by demand for sheets in certain specifications, a reflection of mill conditions. Sales are about equal to those of January.

St. Louis—Further gradual expansion in distribution of iron and steel by warehouses is evident. February volume exceeded that of the preceding month by a small margin, but the total was measurably larger than in February, 1934.

Seattle—Warehouse sales are more active than a year ago. Improved weather conditions are increasing demand in the country and public projects call for a steady flow. Private buying is improving. Prices are well maintained.

Semifinished

Semifinished Prices, Page 79

Tin plate and sheet producers are the heaviest buyers of semifinished material. Tin plate and sheet roll-

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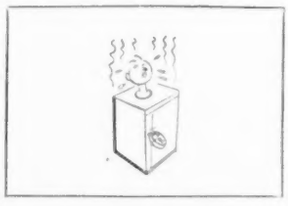

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ing schedules in many plants are at capacity. Billets and wire rods are only in occasional demand. Some buyers' stocks of billets, especially forging quality, are large. The market is firm on the basis of $27, Pittsburgh, for rerolling billets; $32, for forging quality billets, and $49, Pittsburgh, for alloy billets. Common wire rods are $38, Pittsburgh, and combination rods, $40. Tube rounds are firm at 1.80c, Pittsburgh, and skelp, 1.70c.

Metallurgical Coke

Coke Prices, Page 79

Owing to the approach of the close of the domestic coke season plus a heavy coke inventory held by many retailers, producers of beehive and by-product coke have experienced some setback. By-product coke continues to figure back to about $3.35 to $3.60 per ton, ovens, to Pittsburgh producers. The Connellsville, Pa., beehive market holds unchanged and producers still are quoting $3.60 for furnace coke contracts, $3.85 for immediate shipment of furnace coke, and $4.60 for common foundry grades.

Chicago suppliers find foundry coke shipments increased in February, the daily rate being the highest in nearly five years. Prices for March are unchanged at $8.50, ovens, for outside delivery, and $9.25, delivered, Chicago. By-product foundry coke shows some recession in the Cincinnati district. In the St. Louis district consumption is steady but producers have increased operations to enlarge stocks.

Coke By-Products

Coke By-Product Prices, Page 79

New York—Contract shipments of distillates are active, notably toluol and xylol to the lacquer trade, due largely to automobile requirements. The chemical industries are active buyers and some distributors are turning down spot inquiry. Naphthalene shipments also are heavy. Prices, which have been inclined to weakness, are firmer. Fertilizer interests taking larger shipments of sulphate of ammonia at unchanged prices. Phenol is more active, with good industrial demand and steady prices.

Ferroalloys

Ferroalloy Prices, Page 80

New York—With the opening of books for second quarter at unchanged prices, actual contracting in ferromanganese has improved; however, specifications continue to reflect the downward trend in steelmaking operations. The daily rate of shipments for February is said to have been smaller than in January. The market is $85, duty paid, Atlantic and Gulf ports.

Domestic spiegeleisen prices have been extended for second quarter at $26, Palmerton, Pa., for quantities up to 50 tons and $24 on lots of 50 tons and over. Routine contracting features activity with the opening of books March 1 for next quarter.

Chrome ore has advanced $1 a ton, 48 per cent material now holding at $19 to $19.50 c.i.f. Atlantic ports. The movement in this material in recent months has been a feature of the foreign ore market in this country.

Steel in Europe

Foreign Steel Prices, Page 82

London—(*By Cable*)—Pig iron demand in Great Britain is restricted mainly to spot lots, although domestic buying of hematite is brisk. Inquiries for forward contracts are increasing. The market for semifinished steel is more active. Steel production is unchecked, although producers in the Midlands report a lull in new business. Tin plates are in better demand but galvanized sheets are quiet. The domestic sheet trade is improving.

The Continent reports export trade is unusually dull. France is faced by Dutch competition in pig iron. Germany has been booking some business, about half of which is said to be by barter.

Nonferrous Metals

Nonferrous Metal Prices, Page 80

New York—Nonferrous metals were the most active in weeks so far as new developments are concerned. Following recent weakness in export copper, the market firmed and the price rose rapidly with the announcement that producers would meet here early in March to discuss chiefly curtailment of output abroad. Zinc prices pushed upward as curtailment of about 20 per cent in this industry also appeared assured. Tin was unsettled with the market nervous as prices plunged here, reflecting further weakness in London.

Copper—Sales in the domestic market continued at the best pace since June with the total for February 30,513 tons. Market held steady

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at 9.00c, Connecticut, for electrolytic. Foreign copper closed for the week around 6.72½c, c.i.f. European ports compared with the opening 6.42½c, c.i.f.

Lead—Demand showed marked improvement with battery makers and corroders accounting for the bulk of the business. Stocks of refined lead in the United States were reported reduced 5464 tons during January. One large seller continued to get a $1 premium on the New York basis but the uneven distribution of business is expected to preclude any immediate price advance above the current level of 3.55c, New York, and 3.40c, East St. Louis.

Zinc—Sellers were reluctant to do business last week despite the price advances due to the impending output curtailment plan. Prime western advanced from last week's level of 3.70c, East St. Louis, to 3.85c by Thursday. The trade is hopeful of working the price up to the 4-cent level.

Tin—Weakness in the London market was due to several factors, including to a growing opposition to pools, lack of Buffer pool support and liquidation of large holdings. Control of the situation, it is claimed, is not out of hand and a further sharp decline in prices is not being entertained seriously in the trade. Straits prices here dropped from 49.12½c Saturday, Feb. 23 to as low as 47.35c Thursday. A slight recovery was made, however, by the end of the week.

Antimony—Only small lots were moved again last week and prices here held unchanged on the basis of $14.50c, duty paid, for Chinese spot.

Aluminum—Market was quiet with prices unchanged.

Institute

(*Concluded from Page 24*)

ping the fabricated products to ultimate destination, but that the charges in all cases were not the same and therefore gave rise to unfair competitive conditions.

The regulations were designed to rectify this situation, it was indicated. However, they met with stout opposition from fabricators, and the matter was again reviewed not only, it is said, with an idea of observing results of the regulations in actual practice, but also of reconciling divergent opinions.

Briefly, the fabricators set up five principal objections. The first objection was over a ruling requiring prepayment of outbound freight by the fabricator. This has not been changed by the amendments, fabricators declare. The second had to do with what fabricators describe was the unnecessary imposition of a costly and complicated accounting system. This, neither, has been corrected, they say.

The third pertained to scrap loss and this has been rectified. An allowance not to exceed 6 per cent will be permitted.

The fourth ruling objectionable to fabricators prohibited the use of stock material on identified structures. This has been revised in part, to permit substitution when the material is shipped from the same mill as identified material. However, it is pointed out, the amendments do not permit substitution of material purchased from a mill located at another base.

The final outstanding objection has been modified, it is said, by permission to ship by trucks and other types of carriers, instead of by railroads alone.

Labor

EMPLOYES of the steel industry receiving hourly, piecework or tonnage wages in January, 1935, earned the highest average hourly wage rate paid by the steel industry since employment and payroll records have been collected by the American Iron and Steel Institute.

Total steel payrolls in January were 25 per cent ahead of December, 1934, and 27 per cent higher than in January, 1934. Substantial gain in number of employes was also made during the month.

Steel payrolls last month were $44,328,552, compared with $35,362,732 the month before, and $34,877,542 in January a year ago. The January total was the highest since June of last year and was exceeded in only three months during 1934.

A total of 407,071 employes was on the industry's payroll in January, against 386,345 in December and 393,013 in January, 1934.

Employment records for January, 1935, are compared with the preceding month in the following table:

	Jan., 1935	Dec., 1934
Total number all employes	407,071	386,345
Total payrolls all employes	$44,328,552	$35,362,732
Hrs. per week per wage earner	33.6	27.4
Av. earnings per hour of wage earners	65.5c	65.0c
Operating rate	47.67%	35.27%

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head of the self-styled "nationol organization committee" of the rank-and-filers who broke away from the Amalgamated Association of Iron, Steel and Tin Workers a few weeks ago, an indignant telegram was dispatched to Washington Feb. 27.

Addressed to William Green, A. F. of L. president, the Pittsburgh insurgents demanded a definite stand in the steel industry's union troubles and asked Mr. Green to "quit straddling the fence."

HOOK SEES 30-HOUR WEEK A HANDICAP TO LABOR

The Black 30-hour bill, instead of aiding recovery, would drastically interfere with that much desired objective and cripple the purchasing power of American workers, declared Charles R. Hook, president, American Rolling Mill Co., Middletown, O., in a broadcast over the Columbia network Feb. 28.

The steel code, Mr. Hook pointed out, provides an average work-week of 40 hours but in 1934 steel workers averaged only 29.7 hours; had a rigid 30-hour law been in effect, the average would have been 23 to 24 hours with proportionate reduction in labor's income.

If hourly rates were increased one-third above present levels to compensate for shorter hours, as is contemplated by the bill, the added wage cost for the steel industry in 1934 would have been $185,000,000, Mr. Hook warned.

BAR IRON WAGE RATE HOLDS

Wage rates in bar iron mills having contracts with the Amalgamated Association of Iron, Steel and Tin Workers will be unchanged for March and April. The card rate, based on average prices in January and February, as determined in conference last week, is 2.00c per pound for boiling, and bar and 12-inch mills, and 2.10c for guide and 10-inch mills. Puddlers will continue to receive $11.80 per ton.

Financial

BALDWIN LOCOMOTIVE WORKS, Eddystone, Pa., filed a petition Feb. 25 under provisions of the revised federal bankruptcy act providing for reorganization of the company.

An order was entered by Judge Dickinson approving this petition as complying with the statutory provisions. This order provides that Baldwin may continue temporarily in possession of its properties with authority to continue to operate its business as heretofore.

This action affects the parent company only and does not affect the status of any of its subsidiaries. Pursuant to the terms of the order, the business of the Baldwin Locomotive Works will be continued for the present at least without cessation of operations or change in operating conditions or business relations. This action has been made necessary through the reduction of the company's working capital to a place where it cannot meet its operating expenses and also its fixed charges. Plans are under way for the reorganization of the company's financial structure to reduce its fixed charges and to provide working capital.

Equipment

Additional equipment news, p. 25

Chicago—The new plant of Electromotive Corp., General Motors Corp. subsidiary, to be built here for the manufacture of diesel-electric locomotives is a subject of interest to machinery and plant equipment suppliers, since a fairly large number of machine tools and other machines will be purchased. Inquiries for this equipment are expected to be issued within the next several weeks. February showed a decrease in sales of certain types of plant equipment though inquiries continued in fair volume. Machine tool sales were lighter, with the outlook held moderately favorable by the maintenance of inquiries. The largest of these is for the Rock Island arsenal, but a fair number of miscellaneous users have equipment pending.

Boston — Machine-building plant schedules are fairly high in numerous instances, notably in the Hartford, Conn., and Worcester, Mass., districts. Backlogs on government orders account for this activity in some instances. Ball bearing producers are somewhat busier. Grinding machinery builders have booked some volume from automobile accessory plants. One textile machinery builder in the Worcester district is fairly active.

New York—Inquiry for machinery and plant equipment has retained recent improvement with some gains in individual sales, generally for one or two units at a time. A considerable volume has been figured. Marked improvement in heavier handling equipment, including cranes, has been a recent development. Morgan Engineering Co., Alliance, O., has been awarded two 10-ton electric overhead cranes for the Brooklyn navy yard.

St. Louis—Of the $5,584,000 which the federal court here authorized the Missouri Pacific railroad and subsidiaries to spend in 1935 for maintenance and improvements the following allocations have been announced:

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Missouri Pacific, shop machinery and tools, $174,000; roadway machinery and tools, $64,500; International Great Northern, shop machinery and tools, $800; road machinery and tools, $5800; New Orleans, Texas & Mexico, shop machinery and tools, $1450; St. Louis, Brownsville & Mexico, shop machinery and tools, $4820.

Seattle—Maj. C. F. Williams, United States engineer, Portland, Oreg., is asking bids March 12 for furnishing a derrick, emergency dam and unwatering gates, estimated at $100,000, for the Bonneville dam project.

Construction and Enterprise

New York

NEW YORK—John B. Salterini Inc., manufacturer of ornamental iron, has leased a building at 322 East Forty-fourth street for manufacturing purposes.

NEW YORK—Lincoln Steel Products Corp., 60 East Forty-second street, has been incorporated by Emanuel Voss, M. W. Amberg, W. C. Hays and C. H. Brushaber, to deal in new as well as surplus and defective steel materials and metals of all kinds. The company will engage in both export and domestic business.

RENSSELAER, N. Y.—General Aniline Works Inc., Riverside avenue, will soon take bids for construction of 5-story addition to factory. Total estimated cost $80,000.

Pennsylvania

BRADFORD, PA.—Anthony Pessia welding shop was damaged by fire.

BRIDGEVILLE, PA.—American Cyanamid & Chemical Co. is receiving bids for a 4-bay addition to chemical building No. 6, 80 x 93 feet.

PHILADELPHIA—Bureau of supplies and accounts, navy department, Washington, will take bids March 8, schedule 4405, two motor-driven universal cutter grinder machines; schedule 4406, one motor-driven drilling and tapping machine; schedule 4407, one motor-driven universal milling machine; schedule 4409, one motor-driven vertical shaper machine; schedule 4410, one motor-driven grinding machine; schedule 4411, one motor-driven grinding machine; schedule 4416 one motor-driven universal shaper; schedule 4426, one motor-driven, plain wide range milling machine; schedule 4437, 18 pneumatic grinders, all for delivery at Philadelphia.

SHARON, PA.—J. C. Herman & Co. has completed plans for a bottling building at 35 South Irvine street, and will take bids about the first of March.

WARREN, PA.—United Refining Co. has awarded contracts for installation of a new cracking unit, flash chamber, bubble tower and hot oil pump at its plant here. Installation of new equipment will practically double the firm's output of gasoline.

Ohio

COSHOCTON, O.—Coshocton Bottling Co. is considering erecting a new bottling plant soon.

SALINEVILLE, O. — Co - operative Coal Mining Co. recently sustained damage by fire to one of its coal tipples here.

WELLSVILLE, O.—Sterling China Co. will begin work soon on a $175,000 expansion program at its plant here. Plans provide for erection of two new tunnel kilns an office building and general factory extensions. C. C. Pomeroy is president.

Wisconsin

HUDSON, WIS. — Willow River Power Co. plans rebuilding of hydro-electric generating plant, recently damaged by flood.

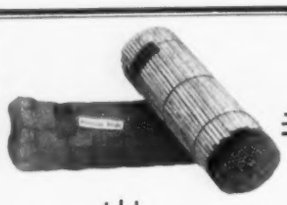
RACINE, WIS.—Jorland Mfg. Co. has been incorporated to manufacture laundry and dry cleaning machinery, by K. E. Sutherland, John Jorgenson and John P. Jorgenson.

Michigan

BUCHANAN, MICH.—City is seeking financial aid from federal government for erection of a sewage disposal plant estimated to cost $150,000.

CARLETON, MICH.—Dunham-Moore Mfg. Co. has been incorporated to manufacture machinery, by Henry Nau Jr., 324 South Laurel avenue, Royal Oak, Mich.

DETROIT—Kurth-Hanson Inc., 14262 Birwood avenue, has been incorporated



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to deal in metals, by Olaf H. Hanson, 227 South Eastlawn avenue.

DETROIT—Metals, Trading & Refining Corp. has been incorporated to deal in metal products, by Joseph M. Davidson, 2480 Fullerton avenue.

DETROIT—Syncro Devices Inc. has been incorporated by Harry L. Pierson, 5450 West Jefferson avenue, to deal in mechanical devices.

DETROIT—Detroit Vapor Stove Co., 3972 Penobscot building, has been incorporated to do general manufacturing, by Howard E. Blood, 670 East Woodbridge street.

DETROIT—Detroit Gear & Machine Co., 3972 Penobscot building, has been incorporated to do general manufacturing, by Howard E. Blood, 670 East Woodbridge street.

DETROIT—Acme Die Casting Co., 11831 Charlevoix street, had been formed to manufacture dies, by Daniel D. J. Jend, 1127 Berkshire road, Grosse Pointe, Mich.

DETROIT—Special Screw Products Co., 1457 Franklin street, has been organized to deal in screw products, by Lester E. Deeley, 1462 National Bank building.

DETROIT—Aaron DeRoy Motor Car Co., Woodward avenue at Garfield, is moving to larger quarters in Convention hall, 4437 Woodward avenue, and will spend $55,000 for improvements, including service department equipment.

DETROIT—Ainsworth Mfg. Corp., Dubois and Franklin streets, manufacturer of stampings and machined parts for the automotive industry, has appropriated $750,000 out of surplus to replace some of its older buildings and to improve its manufacturing efficiency. Charles H. Ainsworth is president.

GRAND RAPIDS MICH.—Grand Rapids Brewing Co., which recently purchased the Muskegon Brewing Co. at receiver's sale, has started extensive improvements on the plant. A new brew house is under construction and other contemplated alterations will mean an additional investment of $50,000. (Noted Dec. 24).

GRAND RAPIDS, MICH.—Knecht, McCarty & Thebaud, Grand Rapids, Mich., architects, have completed preliminary plans for additions and improvements to the state hospital at Kalamazoo, Mich., including $100,000 worth of improvements to the power facilities. Project is awaiting approval of state legislature.

LANSING, MICH. — Olds Motor Works, subsidiary of General Motors Corp., Detroit, plans installation of motors and controls, conveyors and other equipment in its new addition. Cost about $175,000.

Indiana

EAST CHICAGO, IND.—Klepner-Marco Metals Co., 1015 East 149th street, has been incorporated by Meyer and Abe Klepner and George Marco, to deal in scrap metals.

HAGERSTOWN, IND.—Work on the construction of a new warehouse and shipping department has been begun at the plant of the Perfect Circle Co. The improvements will be completed late in April and will cost more than $60,000.

LAWRENCEBURG, IND.—J. E. Pepper Distilling Co. has awarded contract for distillery to A. Lubrecht, Covington, Ky. Estimated cost $73,000.

LAWRENCEBURG, IND. — Old Quaker Distilling Co. has awarded contract for a 10-story, 150 x 158 foot plant and warehouse to Frank Messer & Sons, 2515 Burnet avenue, Cincinnati, at a cost of about $300,000.

LAWRENCEBURG, IND.—G. T. Stagg Co., has awarded contract to Frank Messer & Sons, 2515 Burnet street, Cincinnati, for construction of distillery and warehouse, estimated to cost $100,000.

PERU, IND.—Kingsbury & Co., J. W. Phillips superintendent, has awarded contract for chemical fertilizer factory to Clifton & Son, Peru, Ind.

ROCHESTER, IND. — Shamrock Hardware Foundry Corp. has been formed to manufacture gray iron castings, by Hiram G. Miller, resident agent, J. Murray McCarty and Charles C. Campbell.

Illinois

CHICAGO—John A. Kern Inc., 224 North Sheldon street, has been incorporated by John A. Kern, Adolph Fischer and George R. Randall to manufacture dies, tools, stamping machinery, and appliances. Correspondent: A. C. Cremerius, 1553 West Madison street.

CHICAGO—Walmun Co., 138 North Clark street, has been organized to do a general automotive and industrial accessories and products business, by

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ALL GRADES, SIZES AND SHAPES

DRILL RODS
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PITTSBURGH TOOL STEEL WIRE CO.
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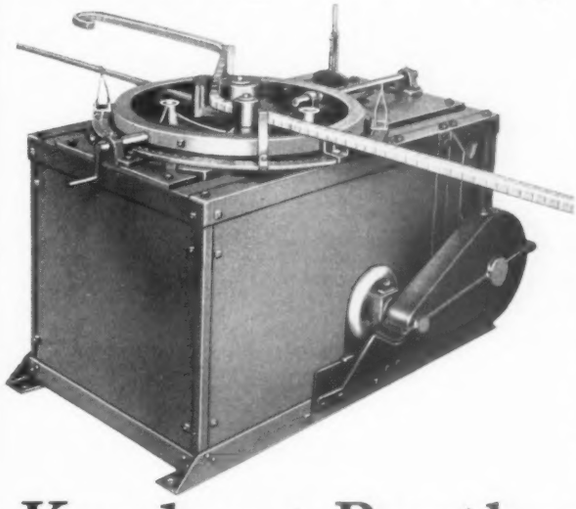
Kardong Four-way Bender

Model D-2



The Model D-2 Kardong Four-way Bender was designed because of the popular demand for this type of Bender.
In the bending of large bars they do not have to be turned over to make the reverse second bends and in the 180 degree hook bars, after making the first hook the bending member is in position to make second hook by just switching resistance roller to opposite side.
The resistance roller plates are adjustable. The same construction is carried thru on this machine as in all of our benders and is guaranteed to give absolute satisfaction. Ask for catalogue of our complete line of reinforcing steel bar benders.

Kardong Brothers, Inc.
Minneapolis, Minn.

Joseph V. Murphy, C. A. Moore and J. R. Casper. Correspondent: Joseph V. Murphy, 12 City Hall Square building.

CHICAGO—Warwick Mfg. Co., 1731 Belmont avenue, has been incorporated by Gordon G. Brittan, John S. Holmes and Frederick L. Holmes, to engage in a general manufacturing and merchandising business. Correspondent: Lawrence C. Mills, 111 West Washington street.

Alabama

LEEDS, ALA.—Universal Atlas Cement Co., 208 South LaSalle street, Chicago, S. J. Robinson assistant chief engineer, is planning to rebuild and remodel its plant here at a cost of approximately $300,000.

District of Columbia

WASHINGTON—Bureau of supplies and accounts, navy department, will take bids March 15, schedule 4430, corrosion-resisting steel forgings.

Florida

GRACEVILLE, FLA.—Rex Lumber Co. is installing planers, a lathe and two shingle mills in its woodworking plant.

MIAMI BEACH, FLA.—City, Morris N. Lipp city engineer, is applying for funds of $1,500,000 for electric light and power plant, $80,000 for elevated steel water tank, $80,000 for storage tank for sanitary sewerage system, and $60,000 for 1100 feet of 20-inch cast iron water pipe.

Kentucky

COVINGTON, KY.—Building occupied by the Precision Truing Machine Co. and the Cincinnati Abrasive Wheel Co. recently was severely damaged by fire.

Louisiana

MANSURA, LA.—Mansura Cotton Oil Mill is planning to rebuild its plant recently damaged by fire. Estimated cost, including equipment, $28,000.

NEW IBERIA, LA.—De Luxe Food Corp. of Louisiana, Edward Makofsky president, is completing erection of its cheese plant and will install special machinery.

Maryland

BALTIMORE—Kress Farm Dairy, 2416 East North avenue, has plans in progress and will soon receive bids for alterations and equipment to its plant at Preston and Wolfe street.

CAMBRIDGE, MD.—Cities of Cambridge, Hurlock and Vienna, and Worchester county commissioners are applying for funds for municipal lighting plant, and $40,000 for warehouse and grain elevator.

TILGHMAN, MD.—City is applying for funds of $254,000 for construction of waterworks system and $47,000 for sewerage system.

Mississippi

JACKSON, MISS.—William M. Snyder, attorney, New Merchants Bank building, is representing a client who is considering establishment of a carton manufacturing plant and also is representing a company that is contemplating erection of a $2,000,000 manufacturing plant near here.

North Carolina

ENGELHARD, N. C.—Pamlico Ice & Light Co. has been incorporated with $100,000 capital, by B. W. Godwin, Chuckatuck, Va., and P. D. Midgett Jr., Engelhard, N. C.

GREENSBORO, N. C.—P. L. Hanks, engineer, is preparing plans for erection of a distillery at North Garden, Va., for the Virginia Brandy Co., Richmond, Va. Estimated cost $100,000.

WINSTON-SALEM, N. C.—Park-T-Pak Bottling Co. has been formed with $25,000 capital by William P. Wilkes and Joseph F. Woodruff.

South Carolina

GEORGETOWN, S. C.—Apte Bros. Cannery Co., Miami, Fla., has leased a plant and will operate a cannery here. Equipment for canning vegetables and meat will be installed.

SUMMERVILLE, S. C.—Ashley Lumber Corp. has been incorporated by F. P. Prettyman and Legare Walker.

Tennessee

CAMDEN, TENN.—City has rejected bids for deep well tank and tower

Snowden Samuel
President

S. A. Cochran
Vice Pres.

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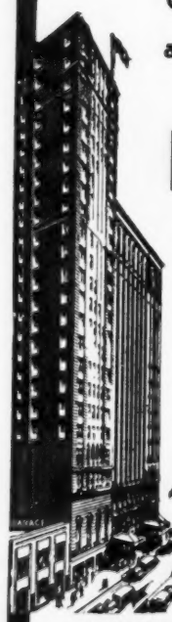

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and will shortly call for new bids. Contract for waterworks system has been let to Volz Construction Co., Baltimore building, Memphis, Tenn., at $42,000.

COOKEVILLE, TENN.—Brass foundry of the Tennessee Polytechnic institute recently sustained damages by fire.

MEMPHIS, TENN.—Machinery Salvage Co., 890 Shrine building, recently organized by Monroe Gotten, H. B. Gotten and M. O. Carter, will specialize in buying, selling and dismantling used machinery, and will also handle new machinery.

SHEEDVILLE, TENN.—Whitcomb & Ballou, Morristown, Tenn., is planning to build a lumber and saw mill here at a cost of about $30,000.

West Virginia

BENWOOD, W. VA.—Standard Slag Co., Youngstown, O., has started work on building a slag plant here, to include a scale house and crushing plant.

Missouri

SENECA, MO.—City will receive bids soon for 25,000 foot of 2, 4 and 6-inch pipe for water system, 75,000-gallon elevated tank and tower and other waterworks equipment, to cost about $42,000. Albert C. Moore, Joplin, Mo., consulting engineer.

Arkansas

CABOT, ARK.—City is preparing plans for a waterworks system to cost approximately $41,000. F. A. Prichett, Wallace building, Little Rock, Ark., engineer.

EUREKA, ARK.—Civic federation is interested in erecting a light plant.

MONETTE, ARK.—City is planning a $45,000 waterworks system. T. H. Allen, engineer, 65 McCall street, Memphis, Tenn.

Oklahoma

ARDMORE, OKLA.—City is planning rehabilitation of sewage disposal plant at an approximate cost of $40,000, requiring addition to chemical treating apparatus, a mechanical mixer in an existing circular tank, two mechanical distributors to be installed in existing sprinkling filters and new sludge digesters to be built. W. R. Holway, consulting engineer, Tulsa, Okla.

Texas

BLUE RIDGE, TEX.—City has applied for funds for 50,000-gallon tank and tower, pumps, meters, fire hydrants, etc. D. C. Walmsley, engineer, 102 Thomas building, Dallas, Tex.

HOUSTON, TEX.—Edle Lumber Co. has been incorporated with $25,000 capital by E. L. Crain and W. L. Conover, 2116 Fannin street.

SAN SABA, TEX.—Arhelger Machine Shop is making additions to its plant and is adding some new equipment, including a new forge, anvil and tools.

TOM BEAN, TEX.—City will receive bids about March 15 for deep well, 50,000-gallon elevated tank, pumps, meters, etc. D. C. Walmsley, engineer, 102 Thomas building, Dallas, Tex.

Pacific Coast

LONG BEACH, CALIF.—Fibreboard Products Co. is constructing a factory building at 4222 Santa Ana street, South Gate, Calif., near here, at a cost of about $30,000.

PORTLAND, OREG.—Safeway Stores will call bids soon for a $500,000 warehouse and bakery at Southeast Third and Pine streets. Plans are being completed by F. Marion Stokes, architect, Terminal Sales building.

SEATTLE—Richfield Mining Co. Inc. has been incorporated with $90,000 capital, by F. A. Nilsen and associates, 1230 Joseph Vance building.

SEATTLE—Tri-State Oil & Gas Co., 1426 Joseph Vance building, has been organized by C. R. Bronson and associates, with capital of $50,000.

SPOKANE—Gnome Gold Mining Co., 745 Peyton building, has been incorporated with $300,000 capital.

SPOKANE—Silver Loaf Baking Co. has purchased a building at 1102 Ide street to which an addition is being built for a modern plant with new equipment, at a cost of $100,000.

WALLA WALLA, WASH.—Walla Walla Grain Growers Inc. has acquired the grain handling facilities of the Farmers' National Warehouse Corp. and plans to construct two elevators at Eureka and Clyde, Wash., with total capacity of 235,000 bushel.

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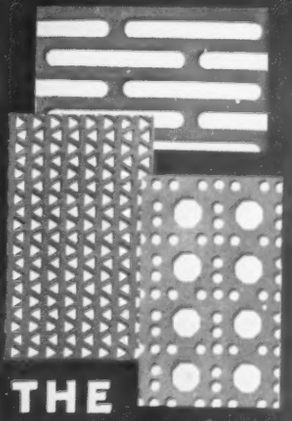

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STATISTICS OF IRON AND STEEL INDUSTRY

From department of commerce except shipments by U. S. Steel Corp., foundry equipment by Foundry Equipment Manufacturers association, river traffic by U. S. engineers at Pittsburgh, electric power by geological survey

U. S. Steel Corp.

Automobiles

1933	Production —United States— Total*	Production —United States— Passenger cars	Canada Total
Jan.	128,825	109,828	3,358
Feb.	105,477	89,976	3,298
March	115,272	96,809	6,632
April	176,432	149,344	8,255
May	214,411	180,597	9,396
June	249,727	207,562	7,323
July	229,357	191,261	6,540
Aug.	232,855	191,346	6,079
Sept.	191,800	157,367	5,808
Oct.	134,683	104,807	3,682
Nov.	60,683	40,754	2,291
Dec.	80,565	49,490	3,262
Year	1,920,057	1,569,141	65,924
1934			
Jan.	156,907	113,331	6,904
Feb.	231,707	187,639	8,571
Mar.	331,263	274,722	14,180
Apr.	354,745	289,030	18,363
May	331,652	273,765	20,161
June	308,065	261,852	13,905
July	266,576	223,868	11,114
August	234,810	183,500	9,904
Sept.	168,871	123,909	5,579
Oct.	132,491	84,503	3,780
Nov.	78,465	45,550	1,697
Dec.	183,187	127,944	2,732
Year	2,778,739	2,189,613	116,890

*Difference of total and passenger cars equals number of trucks. †Average monthly shipments, 1922-23-24 taken as 100.

Shipments

To consumers only, inter-company shipments not included

1933	Tons Total
Jan.	285,138
Feb.	275,929
March	256,793
April	335,321
May	455,302
June	603,937
July	701,322
Aug.	668,155
Sept.	575,161
Oct.	572,897
Nov.	430,358
Dec.	600,639
Year	5,805,235
1934	
Jan.	331,777
Feb.	385,500
Mar.	588,209
Apr.	643,009
May	745,063
June	985,337
July	369,938
August	378,023
Sept.	370,306
Oct.	343,962
Nov.	366,119
Dec.	418,630
Year	5,925,873

Fabricated Shapes

75-80 Per Cent of Industry Reporting

1933	Net Tons Bookings	Net Tons Shipments
Jan.	73,679	50,965
Feb.	50,955	46,168
March	71,398	54,948
April	46,095	50,387
May	42,600	63,968
June	81,910	64,809
July	56,482	51,303
Aug.	78,379	67,913
Sept.	57,642	64,362
Oct.	53,695	73,139
Nov.	60,896	56,023
Dec.	83,799	56,388
Year	757,530	700,373
1934		
Jan.	74,358	46,774
Feb.	60,036	38,101
Mar.	82,250	50,685
Apr.	98,383	66,782
May	62,391	82,735
June	97,390	81,877
July	57,234	80,326
August	73,559	95,864
Sept.	48,701	80,869
Oct.	51,002	97,853
Nov.	71,115	88,006
Dec.	50,720	69,911
Year	827,139	879,783

Fabricated Plates

Net Tons Bookings

1933	Total	Oil Storage Tanks	Miscellaneous
Jan.	11,128	1,501	8,830
Feb.	16,588	8,347	7,660
March	8,903	1,270	6,787
April	9,502	2,938	6,291
May	16,243	2,858	8,183
June	37,020	20,894	14,013
July	20,058	6,013	11,417
Aug.	16,320	2,581	10,618
Sept.	16,025	1,033	13,602
Oct.	17,839	1,434	12,162
Nov.	14,466	3,734	9,466
Dec.	13,692	2,160	9,819
Year	199,031	55,025	119,569
1934			
Jan.	15,897	3,754	10,512
Feb.	14,641	2,476	10,452
Mar.	38,924	2,202	33,806
Apr.	20,085	2,998	13,447
May	21,891	8,746	10,802
June	27,395	11,019	13,642
July	12,523	2,028	7,901
August	16,293	3,334	10,855
Sept.	15,108	3,445	8,218
Oct.	16,581	927	12,557
Nov.	16,629	3,252	10,252
Dec.	26,025	5,185	15,318
Year	241,992	49,366	157,762

Foundry Equipment Order Index†

1933	
Jan.	68.4
Feb.	16.1
March	9.8
April	19.4
May	25.7
June	45.5
July	48.6
Aug.	56.2
Sept.	34.9
Oct.	42.46
Nov.	36.62
Dec.	43.2
Year	....
1934	
Jan.	37.2
Feb.	65.8
Mar.	75.4
Apr.	67.8
May	66.3
June	70.4
July	50.7
August	43.1
Sept.	46.4
Oct.	55.3
Nov.	80.4
Dec.	66.9
Year	....

Malleable Castings

Net Tons

1933	Output	Shipments	Orders booked
Jan.	12,577	14,248	12,404
Feb.	13,575	14,068	11,077
March	9,756	10,967	12,380
April	17,871	16,666	17,856
May	24,628	23,077	24,671
June	31,118	29,268	31,997
July	30,865	29,155	28,458
August	31,811	30,195	28,323
Sept.	27,078	25,402	22,744
Oct.	24,381	20,422	19,933
Nov.	21,903	19,722	20,776
Dec.	21,870	22,300	26,305
Year	268,617	256,419	258,082
1934			
Jan.	30,417	26,642	32,501
Feb.	33,939	31,412	36,594
March	43,438	41,530	42,961
April	40,742	39,817	38,453
May	37,165	39,493	32,639
June	28,340	31,607	24,499
July	23,388	27,591	21,862
August	23,910	25,784	21,306
Sept.	21,541	20,360	19,511
Oct.	25,317	21,683	18,785
Nov.	28,515	21,615	28,530
Dec.	32,746	29,593	36,505
Year	369,458	357,127	354,146

Steel Castings

Net Tons

1933	Total bookings	Total production
Jan.	14,450	15,378
Feb.	13,179	13,802
March	13,178	14,896
April	15,942	13,492
May	22,612	20,751
June	34,965	29,455
July	31,878	31,718
August	31,502	33,834
Sept.	25,220	28,087
Oct.	26,135	27,826
Nov.	25,558	24,721
Dec.	25,612	23,718
Year	280,231	277,678
1934		
Jan.	26,296	27,644
Feb.	35,698	28,526
March	60,044	39,475
April	63,142	46,242
May	46,831	57,313
June	41,537	50,268
July	41,822	46,182
August	25,538	43,748
Sept.	20,030	31,816
Oct.	24,327	29,142
Nov.	21,552	25,799
Dec.	27,312	23,916
Year	434,131	450,087

Mech. Stokers

—Sales—

1933	Fire tube boilers	Water tube boilers
Jan.	55	13
Feb.	38	23
March	69	17
April	28	34
May	54	44
June	147	50
July	110	67
August	157	61
Sept.	175	28
Oct.	147	31
Nov.	142	40
Dec.	109	13
Year	1,231	421
1934		
Jan.	100	23
Feb.	49	25
March	62	43
April	48	39
May	110	35
June	117	52
July	121	68
August	183	49
Sept.	240	39
Oct.	230	44
Nov.	165	23
Dec.	121	30
Year	1,546	470

Steel Furniture

Dollars

1933	Business shipments	Shelving, shipments
Jan.	582,697	121,395
Feb.	464,256	104,264
March	482,086	137,670
April	404,854	133,782
May	511,838	166,957
June	636,045	165,946
July	522,624	156,244
August	693,089	178,688
Sept.	734,356	163,924
Oct.	825,462	146,087
Nov.	799,741	195,551
Dec.	1,040,077	199,810
Year	7,697,125	1,870,318
1934		
Jan.	993,473	210,205
Feb.	894,076	279,391
March	955,633	394,371
April	934,097	346,403
May	1,010,528	288,446
June	1,045,539	354,050
July	863,439	230,821
August	1,101,469	225,811
Sept.	879,243	260,545
Oct.	997,859	223,769
Nov.	1,038,951	216,704
Dec.	1,090,171	207,883
Year	11,807,843	3,243,636

Babbitt Metal

Pounds 000 omitted

1933	(a) Total production	(b) Sales
Jan.	1,346	1,073
Feb.	1,117	917
March	1,134	941
April	1,544	1,270
May	2,110	1,785
June	2,327	1,877
July	2,484	1,941
August	2,753	2,059
Sept.	2,419	1,800
Oct.	2,090	1,554
Nov.	1,963	1,606
Dec.	1,459	1,043
Year	22,812	17,876
1934		
Jan.	2,256	1,838
Feb.	2,147	1,715
March	2,474	1,976
April	2,527	1,964
May	2,425	1,889
June	2,261	1,618
July	1,988	1,435
August	1,856	1,399
Sept.	1,653	1,273
Oct.	1,807	1,364
Nov.	1,725	1,327
Dec.	2,163	1,622
Year	25,287	19,425

(a) by 40 plants. (b) by 30 manufacturers who produce for sale, including 5 who also report consumption of own metal.

Coke

Net Tons Production

1933	By-Product	Beehive
Jan.	1,784,527	81,900
Feb.	1,638,817	84,100
March	1,666,035	93,300
April	1,656,183	47,000
May	1,921,257	47,300
June	2,241,432	50,100
July	2,797,316	68,400
August	2,923,418	70,600
Sept.	2,712,050	59,500
Oct.	2,581,834	45,000
Nov.	2,334,597	92,800
Dec.	2,454,947	89,500
Year	26,722,400	829,500
1934		
Jan.	2,475,785	107,900
Feb.	2,493,494	129,100
March	2,968,573	161,400
April	2,875,451	71,600
May	3,191,869	63,200
June	2,989,875	61,100
July	2,381,459	50,700
August	2,279,672	43,700
Sept.	2,174,771	54,800
Oct.	2,316,858	75,900
Nov.	2,267,462	94,100
Dec.	2,417,841	83,600
Year	30,833,110	997,100

*For public use.

Electric Power

Millions Kilowatt Hours

1933	Production*
Jan.	6,932
Feb.	6,285
March	6,674
April	6,462
May	6,996
June	6,231
July	7,479
August	7,686
Sept.	7,347
Oct.	7,478
Nov.	7,243
Dec.	7,447
Year	85,260
1934	
Jan.	7,631
Feb.	7,049
March	7,717
April	7,443
May	7,683
June	7,472
July	7,605
August	7,710
Sept.	7,206
Oct.	7,831
Nov.	7,606
Dec.	8,039
Year	90,992

Steel Barrels

Units

1933	Production	Shipments
Jan.	341,382	341,055
Feb.	311,111	312,919
March	427,562	425,682
April	452,086	454,794
May	531,304	531,921
June	643,982	640,596
July	623,056	621,042
August	537,801	527,811
Sept.	580,471	585,842
Oct.	873,536	863,277
Nov.	638,850	644,954
Dec.	610,440	610,365
Year	6,571,581	6,560,258
1934		
Jan.	708,086	706,209
Feb.	573,391	572,915
March	695,681	703,101
April	657,185	658,216
May	494,051	489,186
June	701,826	696,349
July	598,745	608,644
August	361,852	364,081
Sept.	412,592	417,114
Oct.	583,151	575,281
Nov.	467,699	466,933
Dec.	422,985	424,233
Year	6,677,322	6,682,400

River Traffic

Net Tons

1933	Allegheny	Monongahela	Ohio
Jan.	1,627	11,724	18,002
Feb.	1,656	17,904	23,614
March	425	19,546	32,917
April	3,025	35,795	37,191
May	4,400	39,890	46,038
June	815	58,179	56,484
July	3,900	68,453	62,096
August	3,234	67,389	69,531
Sept.	2,000	43,026	38,480
Oct.	4,240	39,026	49,047
Nov.	1,550	28,216	39,573
Dec.	4,130	38,693	31,038
Year	31,007	467,841	509,011
1934			
Jan.	590	27,158	54,109
Feb.	520	12,429	4,373
March	2,180	40,685	47,897
April	5,100	51,995	72,974
May	3,050	72,922	73,361
June	10,195	54,913	83,718
July	2,950	41,231	60,005
August	2,015	32,412	45,840
Sept.	3,750	35,411	45,848
Oct.	3,400	43,347	46,475
Nov.	4,300	48,556	51,710
Dec.	1,300	42,248	46,887
Year	39,350	503,307	633,197

Steel Boilers

New Orders

1933	Total	Units Stationary	Marine
Jan.	197	189	8
Feb.	176	162	14
March	195	186	9
April	236	228	8
May	328	307	21
June	511	496	15
July	498	491	7
August	511	441	70
Sept.	447	442	5
Oct.	395	377	18
Nov.	296	291	5
Dec.	328	310	18
Year	4,118	3,920	198
1934			
Jan.	249	239	10
Feb.	212	198	14
March	294	283	11
April	380	361	19
May	304	294	10
June	415	402	13
July	455	452	6
August	597	584	13
Sept.	626	594	32
Oct.	696	677	19
Nov.	447	436	11
Dec.	331	321	10